List of Practical:	
1.	Develop an ASP.NET Core MVC based Stateless Web App.
2.	Develop a Spring Boot API.
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4.	a. Create an Azure Kubernetes Service Cluster
	b. Enable Azure Dev Spaces on an AKS Cluster
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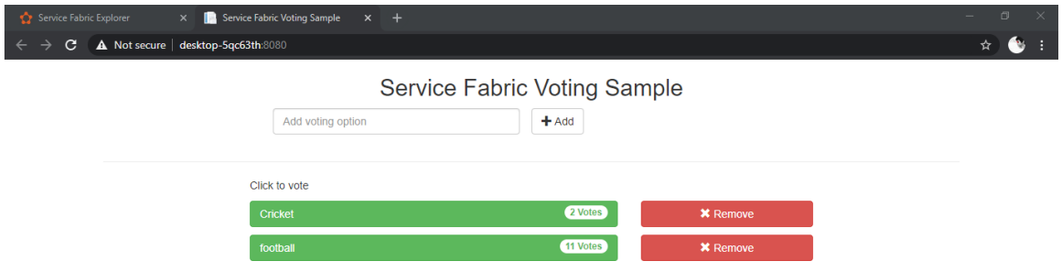
11.	Create an AWS Lambda function
12.	Build AWS Lambda with AWS API gateway

PRACTICAL 01
Develop an ASP.NET Core MVC based Stateful Web App



What Is Service Fabric?
Azure Service Fabric is a distributed systems platform that allows you to run, manage, and scale applications in a cluster of nodes, using any OS and any cloud.
What is Service Fabric Clusters?
Service Fabric helps you deploy your microservices on a cluster, which is a set of virtual or physical machines that are interconnected through a network. Each machine inside the cluster is called a node. A cluster can consist of thousands of nodes, depending on resource needs of your application. Each node in a cluster has a Windows service called FabricHost.exe, which makes sure that the other two executables (Fabric.exe and FabricGateway.exe) are always running on the cluster nodes
What is Model-View-Controller (MVC)?

The Model-View-Controller (MVC) architectural pattern separates an app into three main components: Model, View, and Controller. The MVC pattern helps you create apps that are more testable and easier to update.

Models: Classes that represent the data of the app. The model classes use validation logic to enforce business rules for that data. Typically, model objects retrieve and store model state in a database. In this practical, a Movie model retrieves movie data from a database, provides it to the view or updates it. Updated data is written to a database.
Views: Views are the components that display the app's user interface (UI). Generally, this UI displays the model data.
Controllers: Classes that handle browser requests. They retrieve model data and call view templates that return a response. In an MVC app, the view only displays information; the controller handles and responds to user input and interaction. For example, the controller handles route data and query-string values, and passes these values to the model. The model might use these values to query the database.

Step 1: Create Project

Launch Visual Studio as an administrator.
Create a project with File >New >Project.
In the New Project dialog, choose Cloud > Service Fabric Application.
Name the application Voting and click OK.
On the New Service Fabric Service page, choose Stateless ASP.NET Core, name your service VotingWeb, then click OK.
The next page provides a set of ASP.NET Core project templates. For this practical, choose Web

Application (Model-View-Controller), then click OK.
Visual Studio creates an application and a service project and displays them in Solution Explorer.

Step 2: Create and update the files

In this step we will create and will update file in the VotingWeb project

2.1 Update the site.js file

Open wwwroot/js/site.js. Replace its contents with the following JavaScript used by the Home views, then save your changes.

```
var app = angular.module('VotingApp', ['ui.bootstrap']);
app.run(function () { });

app.controller('VotingAppController', ['$rootScope', '$scope', '$http', '$timeout', function ($rootScope,
$scope, $http, $timeout) {

   $scope.refresh = function () {
      $http.get('api/Votes?c=' + new Date().getTime())
         .then(function (data, status) {
            $scope.votes = data;
         }, function (data, status) {
            $scope.votes = undefined;
         });
   };

   $scope.remove = function (item) {
      $http.delete('api/Votes/' + item)
         .then(function (data, status) {
            $scope.refresh();
         })
   };

   $scope.add = function (item) {
      var fd = new FormData();
      fd.append('item', item);
      $http.put('api/Votes/' + item, fd, {
         transformRequest: angular.identity,
         headers: { 'Content-Type': undefined }
      })
         .then(function (data, status) {
            $scope.refresh();
            $scope.item = undefined;
         })
   };
}]);
```

2.2 Update the Index.cshtml file

Open Views/Home/Index.cshtml, the view specific to the Home controller. Replace its contents with the following, then save your changes.

```
@{
   ViewData["Title"] = "Service Fabric Voting Sample";
}

<div ng-controller="VotingAppController" ng-init="refresh()">
   <div class="container-fluid">
      <div class="row">
         <div class="col-xs-8 col-xs-offset-2 text-center">
            <h2>Service Fabric Voting Sample</h2>
         </div>
      </div>

      <div class="row">
         <div class="col-xs-8 col-xs-offset-2">
            <form class="col-xs-12 center-block">
               <div class="col-xs-6 form-group">
                  <input id="txtAdd" type="text" class="form-control" placeholder="Add voting option" ng-
model="item"/>
               </div>
               <button id="btnAdd" class="btn btn-default" ng-click="add(item)">
                  <span class="glyphicon glyphicon-plus" aria-hidden="true"></span>
                  Add
               </button>
            </form>
         </div>
      </div>

      <hr/>

      <div class="row">
         <div class="col-xs-8 col-xs-offset-2">
            <div class="row">
```

```
            <div class="col-xs-4">
              Click to vote
            </div>
          </div>
          <div class="row top-buffer" ng-repeat="vote in votes.data">
            <div class="col-xs-8">
              <button class="btn btn-success text-left btn-block" ng-click="add(vote.key)">
                <span class="pull-left">
                  {{vote.key}}
                </span>
                <span class="badge pull-right">
                  {{vote.value}} Votes
                </span>
              </button>
            </div>
            <div class="col-xs-4">
              <button class="btn btn-danger pull-right btn-block" ng-click="remove(vote.key)">
                <span class="glyphicon glyphicon-remove" aria-hidden="true"></span>
                Remove
              </button>
            </div>
          </div>
        </div>
      </div>
    </div>
</div>
```

2.3 Update the _Layout.cshtml file

Open Views/Shared/_Layout.cshtml, the default layout for the ASP.NET app. Replace its contents with the following, then save your changes.

```
<!DOCTYPE html>
<html ng-app="VotingApp" xmlns:ng="http://angularjs.org">
<head>
    <meta charset="utf-8"/>
    <meta name="viewport" content="width=device-width, initial-scale=1.0"/>
    <title>@ViewData["Title"]</title>

    <link href="~/lib/bootstrap/dist/css/bootstrap.min.css" rel="stylesheet"/>
    <link href="~/css/site.css" rel="stylesheet"/>

</head>
<body>
<div class="container body-content">
    @RenderBody()
</div>

<script src="~/lib/jquery/dist/jquery.js"></script>
<script src="~/lib/bootstrap/dist/js/bootstrap.js"></script>
<script src="~/lib/angular/angular.js"></script>
<script src="~/lib/angular-bootstrap/ui-bootstrap-tpls.js"></script>
<script src="~/js/site.js"></script>

@RenderSection("Scripts", required: false)
</body>
</html>
```

2.4 Update the VotingWeb.cs file

Open the VotingWeb.cs file, which creates the ASP.NET Core WebHost inside the stateless service using the WebListener web server.

Replace the content with the following code, then save your changes.

```
namespace VotingWeb
{
    using System;
    using System.Collections.Generic;
    using System.Fabric;
    using System.IO;
    using System.Net.Http;
    using Microsoft.AspNetCore.Hosting;
    using Microsoft.Extensions.Logging;
    using Microsoft.Extensions.DependencyInjection;
    using Microsoft.ServiceFabric.Services.Communication.AspNetCore;
```

```
    using Microsoft.ServiceFabric.Services.Communication.Runtime;
    using Microsoft.ServiceFabric.Services.Runtime;

    internal sealed class VotingWeb : StatelessService
    {
        public VotingWeb(StatelessServiceContext context)
            : base(context)
        {
        }

        protected override IEnumerable<ServiceInstanceListener> CreateServiceInstanceListeners()
        {
            return new ServiceInstanceListener[]
            {
        new ServiceInstanceListener(
            serviceContext =>
                new KestrelCommunicationListener(
                    serviceContext,
                    "ServiceEndpoint",
                    (url, listener) =>
                    {
                        ServiceEventSource.Current.ServiceMessage(serviceContext, $"Starting Kestrel on {url}");

                        return new WebHostBuilder()
                            .UseKestrel()
                            .ConfigureServices(
                                services => services
                                    .AddSingleton<HttpClient>(new HttpClient())
                                    .AddSingleton<FabricClient>(new FabricClient())
                                    .AddSingleton<StatelessServiceContext>(serviceContext))
                            .UseContentRoot(Directory.GetCurrentDirectory())
                            .UseStartup<Startup>()
                            .UseServiceFabricIntegration(listener, ServiceFabricIntegrationOptions.None)
                            .UseUrls(url)
                            .Build();
                    }))
            };
        }

        internal static Uri GetVotingDataServiceName(ServiceContext context)
        {
            return new Uri($"{context.CodePackageActivationContext.ApplicationName}/VotingData");
        }
    }
}
```

2.5 Add the VotesController.cs file

a. Add a controller, which defines voting actions. Right-click on the Controllers folder, then select Add->New item->Visual C#->ASP.NET Core->Class. Name the file VotesController.cs, then click Add.

b. Replace the VotesController.cs file contents with the following, then save your changes this file is modified to read and write voting data from the back-end service.

```
namespace VotingWeb.Controllers
{
    using System;
    using System.Collections.Generic;
    using System.Fabric;
    using System.Fabric.Query;
    using System.Linq;
    using System.Net.Http;
    using System.Net.Http.Headers;
    using System.Text;
    using System.Threading.Tasks;
    using Microsoft.AspNetCore.Mvc;
    using Newtonsoft.Json;

    [Produces("application/json")]
    [Route("api/[controller]")]
    public class VotesController : Controller
    {
```

```
        private readonly HttpClient httpClient;
        private readonly FabricClient fabricClient;
        private readonly string reverseProxyBaseUri;
        private readonly StatelessServiceContext serviceContext;

        public VotesController(HttpClient httpClient, StatelessServiceContext context, FabricClient
fabricClient)
        {
            this.fabricClient = fabricClient;
            this.httpClient = httpClient;
            this.serviceContext = context;
            this.reverseProxyBaseUri = Environment.GetEnvironmentVariable("ReverseProxyBaseUri");
        }

        // GET: api/Votes
        [HttpGet("")]
        public async Task<IActionResult> Get()
        {
            Uri serviceName = VotingWeb.GetVotingDataServiceName(this.serviceContext);
            Uri proxyAddress = this.GetProxyAddress(serviceName);

            ServicePartitionList partitions = await
this.fabricClient.QueryManager.GetPartitionListAsync(serviceName);

            List<KeyValuePair<string, int>> result = new List<KeyValuePair<string, int>>();

            foreach (Partition partition in partitions)
            {
                string proxyUrl =
                    $"{proxyAddress}/api/VoteData?PartitionKey={((Int64RangePartitionInformation)
partition.PartitionInformation).LowKey}&PartitionKind=Int64Range";

                using (HttpResponseMessage response = await this.httpClient.GetAsync(proxyUrl))
                {
                    if (response.StatusCode != System.Net.HttpStatusCode.OK)
                    {
                        continue;
                    }

                    result.AddRange(JsonConvert.DeserializeObject<List<KeyValuePair<string, int>>>(await
response.Content.ReadAsStringAsync()));
                }
            }

            return this.Json(result);
        }

        // PUT: api/Votes/name
        [HttpPut("{name}")]
        public async Task<IActionResult> Put(string name)
        {
            Uri serviceName = VotingWeb.GetVotingDataServiceName(this.serviceContext);
            Uri proxyAddress = this.GetProxyAddress(serviceName);
            long partitionKey = this.GetPartitionKey(name);
            string proxyUrl =
$"{proxyAddress}/api/VoteData/{name}?PartitionKey={partitionKey}&PartitionKind=Int64Range";

            StringContent putContent = new StringContent($"{{ 'name' : '{name}' }}", Encoding.UTF8,
"application/json");
            putContent.Headers.ContentType = new MediaTypeHeaderValue("application/json");

            using (HttpResponseMessage response = await this.httpClient.PutAsync(proxyUrl, putContent))
            {
                return new ContentResult()
                {
                    StatusCode = (int) response.StatusCode,
                    Content = await response.Content.ReadAsStringAsync()
                };
            }
        }

        // DELETE: api/Votes/name
        [HttpDelete("{name}")]
```

```
        public async Task<IActionResult> Delete(string name)
        {
            Uri serviceName = VotingWeb.GetVotingDataServiceName(this.serviceContext);
            Uri proxyAddress = this.GetProxyAddress(serviceName);
            long partitionKey = this.GetPartitionKey(name);
            string proxyUrl =
$"{proxyAddress}/api/VoteData/{name}?PartitionKey={partitionKey}&PartitionKind=Int64Range";

            using (HttpResponseMessage response = await this.httpClient.DeleteAsync(proxyUrl))
            {
                if (response.StatusCode != System.Net.HttpStatusCode.OK)
                {
                    return this.StatusCode((int) response.StatusCode);
                }
            }

            return new OkResult();
        }


        /// <summary>
        /// Constructs a reverse proxy URL for a given service.
        /// Example: http://localhost:19081/VotingApplication/VotingData/
        /// </summary>
        /// <param name="serviceName"></param>
        /// <returns></returns>
        private Uri GetProxyAddress(Uri serviceName)
        {
            return new Uri($"{this.reverseProxyBaseUri}{serviceName.AbsolutePath}");
        }

        /// <summary>
        /// Creates a partition key from the given name.
        /// Uses the zero-based numeric position in the alphabet of the first letter of the name (0-25).
        /// </summary>
        /// <param name="name"></param>
        /// <returns></returns>
        private long GetPartitionKey(string name)
        {
            return Char.ToUpper(name.First()) - 'A';
        }
    }
}
```

Step 3: Add a stateful back-end service to your application

a. In Solution Explorer, right-click Services within the Voting application project and choose Add -> New Service Fabric Service....
b. In the New Service Fabric Service dialog, choose Stateful ASP.NET Core, name the service VotingData, then press Create.

Once your service project is created, you have two services in your application. As you continue to build your application, you can add more services in the same way. Each can be independently versioned and upgraded.
The next page provides a set of ASP.NET Core project templates. choose API.
Visual Studio creates the VotingData service project and displays it in Solution Explorer.

3.1 Add the VoteDataController.cs file

a. In the VotingData project, right-click on the Controllers folder, then select Add->New item->Class. Name the file VoteDataController.cs and click Add.
b. Replace the file contents with the following, then save your changes.

```
namespace VotingData.Controllers
{
    using System.Collections.Generic;
    using System.Threading;
```

```
using System.Threading.Tasks;
using Microsoft.AspNetCore.Mvc;
using Microsoft.ServiceFabric.Data;
using Microsoft.ServiceFabric.Data.Collections;

[Route("api/[controller]")]
public class VoteDataController : Controller
{
    private readonly IReliableStateManager stateManager;

    public VoteDataController(IReliableStateManager stateManager)
    {
        this.stateManager = stateManager;
    }

    // GET api/VoteData
    [HttpGet]
    public async Task<IActionResult> Get()
    {
        CancellationToken ct = new CancellationToken();

        IReliableDictionary<string, int> votesDictionary =
            await this.stateManager.GetOrAddAsync<IReliableDictionary<string, int>>("counts");

        using (ITransaction tx = this.stateManager.CreateTransaction())
        {
            var list = await votesDictionary.CreateEnumerableAsync(tx);

            var enumerator = list.GetAsyncEnumerator();

            List<KeyValuePair<string, int>> result = new List<KeyValuePair<string, int>>();

            while (await enumerator.MoveNextAsync(ct))
            {
                result.Add(enumerator.Current);
            }

            return this.Json(result);
        }
    }

    // PUT api/VoteData/name
    [HttpPut("{name}")]
    public async Task<IActionResult> Put(string name)
    {
        IReliableDictionary<string, int> votesDictionary = await
this.stateManager.GetOrAddAsync<IReliableDictionary<string, int>>("counts");

        using (ITransaction tx = this.stateManager.CreateTransaction())
        {
            await votesDictionary.AddOrUpdateAsync(tx, name, 1, (key, oldvalue) => oldvalue + 1);
            await tx.CommitAsync();
        }

        return new OkResult();
    }

    // DELETE api/VoteData/name
    [HttpDelete("{name}")]
    public async Task<IActionResult> Delete(string name)
    {
        IReliableDictionary<string, int> votesDictionary = await
this.stateManager.GetOrAddAsync<IReliableDictionary<string, int>>("counts");

        using (ITransaction tx = this.stateManager.CreateTransaction())
        {
            if (await votesDictionary.ContainsKeyAsync(tx, name))
            {
                await votesDictionary.TryRemoveAsync(tx, name);
                await tx.CommitAsync();
                return new OkResult();
            }
            else
```

```
            {
                return new NotFoundResult();
            }
        }
    }
  }
}
```

Step 4: Publish Service Fabric application

a. In the solution Explorer Right click on the Voting and select Publish. The Publish dialog box appears.
b. To open the service fabric explorer, open the Browser and paste the following IP address http://localhost:19080/
c. Go to cluster >Application >Voting Type >fabric:/Voting >fabric:/VotingWeb > 8482ef73-476d-45a6-aca9-b33d75575855(partition) >_Node_0 Instance
d. You will see the endpoint in the address section click on that address to run your app

PRACTICAL 2

Develop Spring Boot API

Introduction :-

Spring Boot provides a good platform for Java developers to develop a stand-alone and production-grade spring application that you can just run. You can get started with minimum configurations without the need for an entire Spring configuration setup.

In this example, we showcase that it is possible to host a non-Microsoft stack application to a Service Fabric cluster. We will not create a reliable service; instead, we will host a Java Spring Boot–based API as a guest executable and as a container. We will use VS Code to develop a simple Spring Boot application.

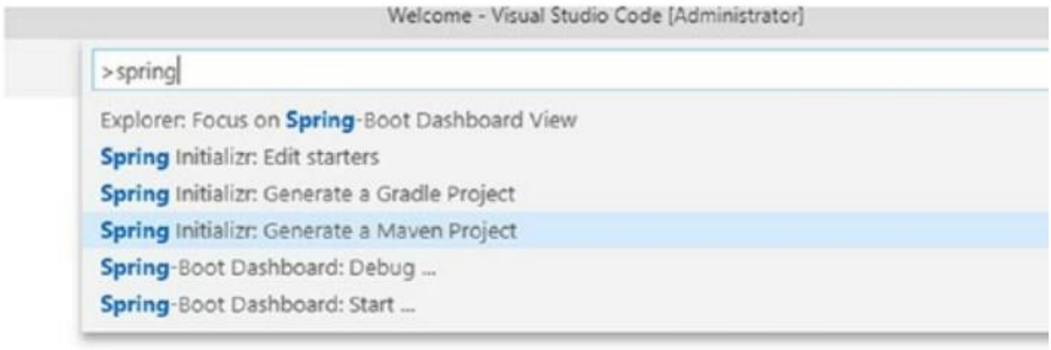
Setting up the Development Environment

Let's set up the development environment.

1. Install Visual Studio 2017.
2. Install the Microsoft Azure Service Fabric SDK.
3. Install Visual Studio Code.
    a. Install Spring Boot Extensions Pack.
    b. Install Java Extensions Pack.
    c. Install Maven for Java.
4. Make sure that the Service Fabric Local cluster is in a running state.
5. Install Docker Desktop.
6. Access the Azure container registry.

Develop a Spring Boot API

Now it's time to get started on the application.

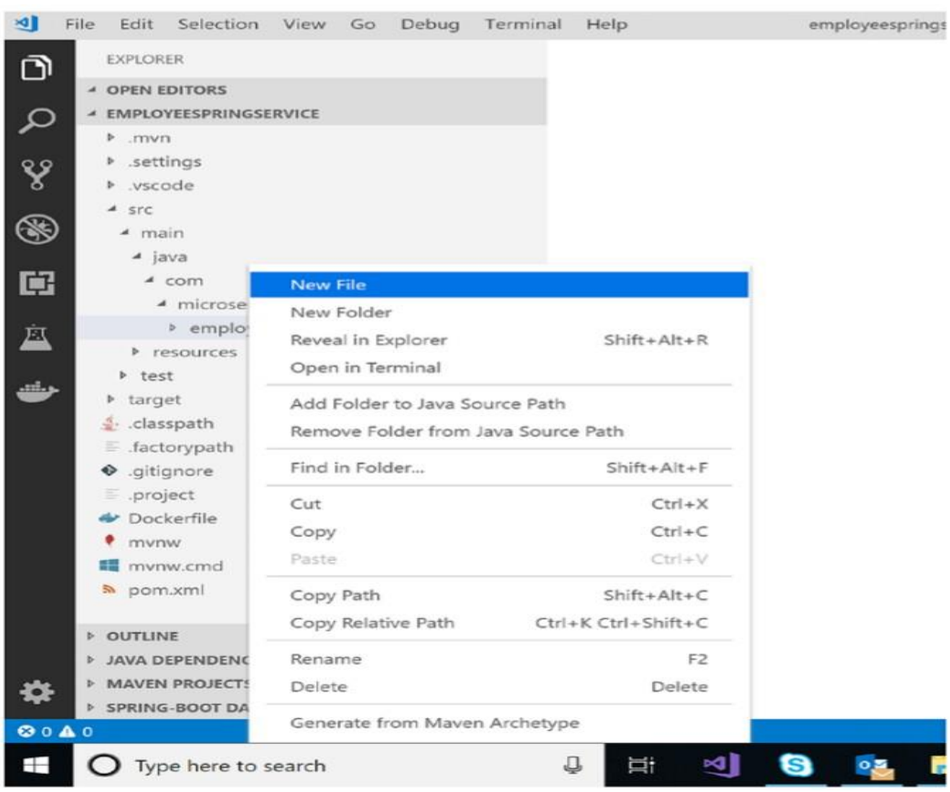


1. Launch Visual Studio Code as an administrator.
2. Press Ctrl+Shift+P to open the command palette.
3. Enter spring in the command palette, and choose Spring Initializr: Generate a maven project

4. Choose Java for Specify Project Language.
5. Enter com.microservices in the input group ID for your project.
6. Enter employeespringservice in the input artifact ID for your project.
7. Choose the latest Spring boot version.

8. Choose the following dependencies.
a. DevTools
b. Lombok
c. Web
d. Actuator
9. Choose the path where you want to save the solution.
10. Right-click the EMPLOYEESPRINGSERVICE folder under src ➤ main ➤ java ➤ com ➤ microservices, as shown in Figure 3-15, and click Add File.
Add a new file
11. Name the file Employee.Java and add the following code. (This is the definition of the employee object; we kept it simple by having only three properties to represent an employee.)

```
package com.microservices.employeespringservice;
import lombok.AllArgsConstructor;
import lombok.EqualsAndHashCode;
import lombok.Getter;
import lombok.Setter;
/*** Employee ***/
@Getter
@Setter
@EqualsAndHashCode
@AllArgsConstructor
public class Employee {
 private String firstName;
 private String lastName;
private String ipAddress; }
```



12. Now let's create an employee service that returns an employee's information. Right-click the employeespringservice folder and add a file named EmployeeService.java. Add the following code to it.

```
package com.microservices.employeespringservice;
import java.net.InetAddress;
import java.net.UnknownHostException;
import org.springframework.stereotype.Service;
/**
 * EmployeeService
```

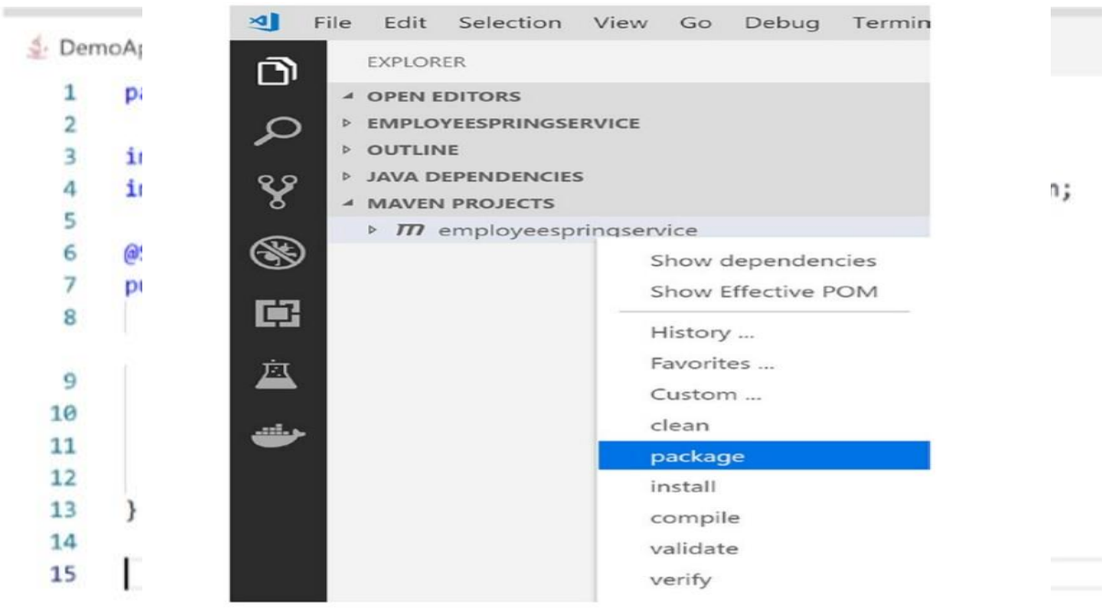
```
*/

@Service
public class EmployeeService {
 public Employee GetEmployee(String firstName, String
lastName){
 String ipAddress;
try {
getHostAddress().toString();
 } catch (UnknownHostException e) {
 ipAddress = e.getMessage();
 }
 Employee employee = new Employee(firstName,
lastName,ipAddress);
 return employee;
 }
}
```

13. Now let’s create an employee controller that invokes the employee service to return the details of an employee. Right-click the employeespringservice folder and add a file named EmployeeController.

```
package com.microservices.employeespringservice;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.ResponseBody;


/**
 * EmployeeController
 */
@Controller
public class EmployeeController {
 @Autowired
```



private

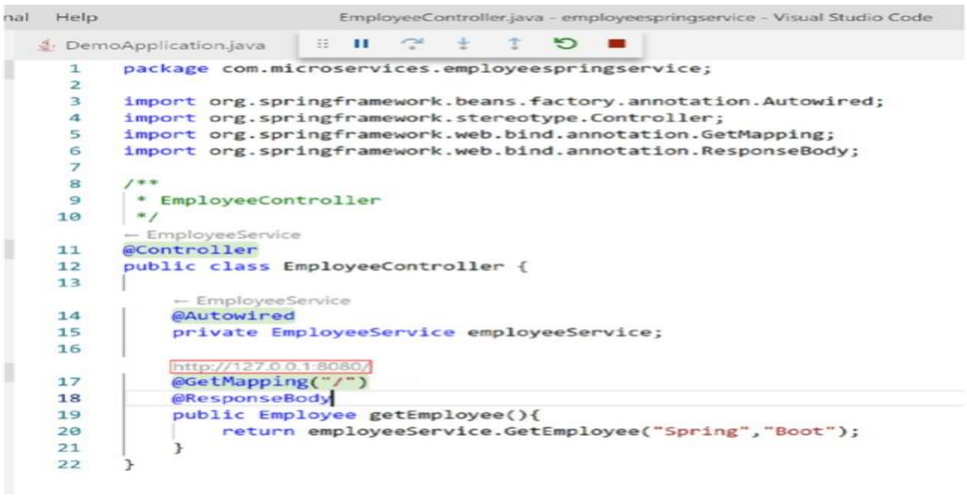
```
EmployeeService employeeService;
@GetMapping("/")
 @ResponseBody
 public Employee getEmployee(){
return employeeService.GetEmployee("Spring","Boot");
 }
}
```

Now you are ready for a simple REST-based service that returns employee information. Visual Studio Code has some cool features to run Spring Boot applications, and we are going to use the same.

1. Open DemoApplication.java and once you open the file, you see the option to run or debug the application,Please note that this may take time as Visual Studio automatically downloads the dependencies.

2. Click Run and open the Controller class. You see the URL where your controller service is hosted.

3. Click the URL and you see the output show in your default browser.

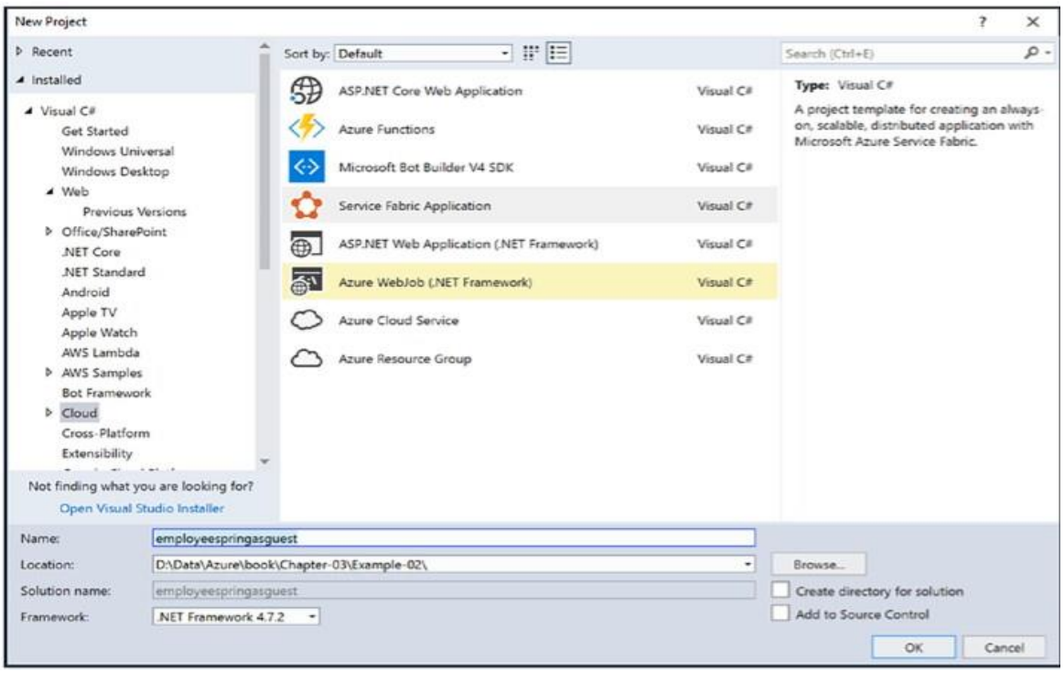


4. Right-click employeespringservice under Maven Projects. Click package,This generates the JAR file.

Now you have a simple Spring Boot-based REST API, and you have generated a JAR file. We will now deploy it to Service Fabric as a guest executable. To deploy, we will use Visual Studio 2017.

Deploy a Spring Boot Service as a Guest Executable

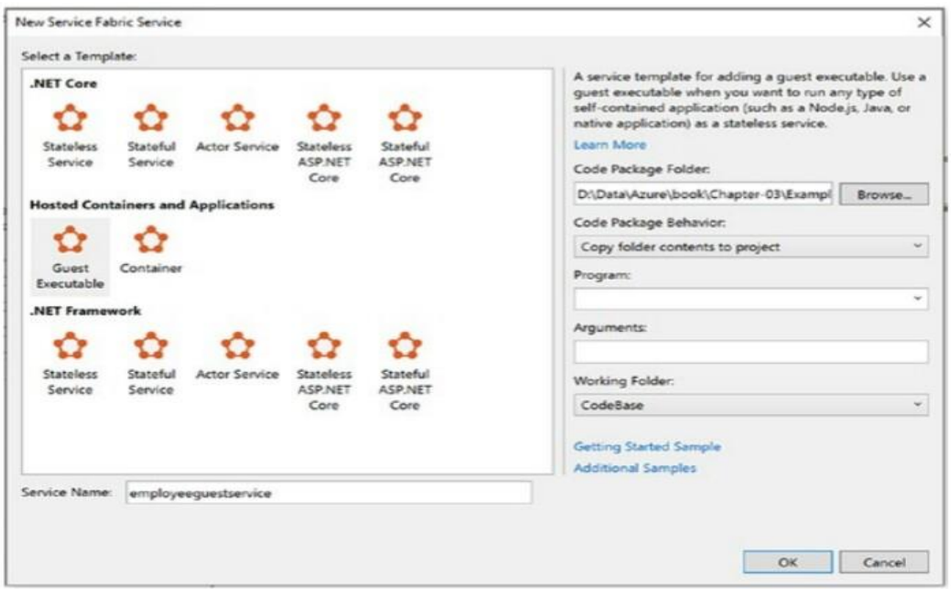
After executing all the steps in the previous section, your development is complete. Please follow



the steps in this section to deploy the developed Spring Boot application as a guest executable. This shows that it is possible to host a non-Microsoft stack application on a Service Fabric cluster by using a guest executable programming model. Service Fabric considers guest executables a stateless service.

1. Launch Visual Studio 2017 as an administrator.

1. Click File ➤ New Project ➤ Select Cloud ➤ Service Fabric Application.
2. Name the application employeespringasguest



3. In New Service Fabric Service, select the following

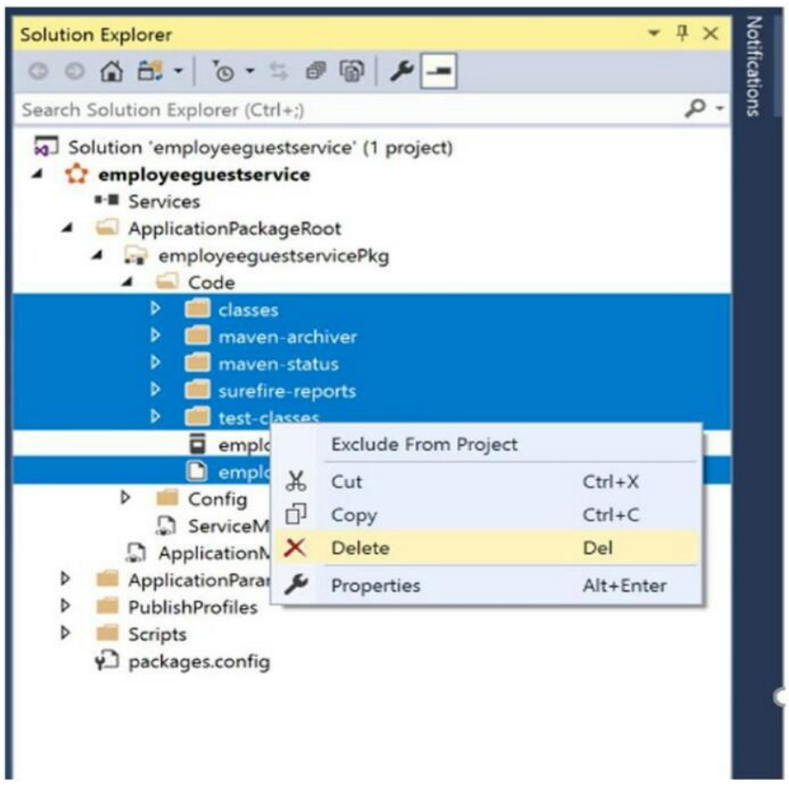
a. Service Name: employeeguestservice

b. Code Package Folder: Point to the target folder in which Visual Studio Code generated the JAR file for the Spring Boot service.

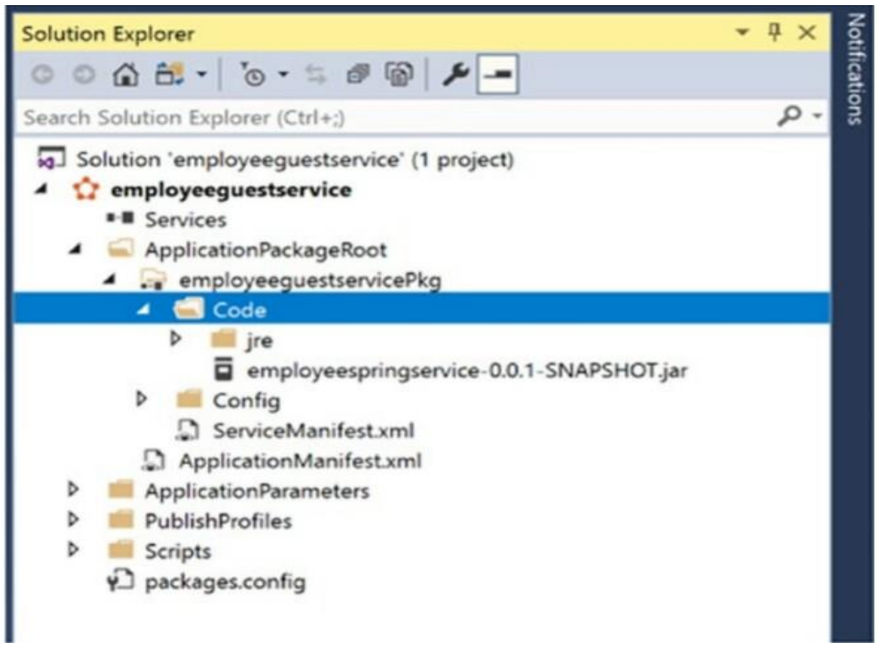
c. Code Package Behavior: Copy folder contents to folder

d. Working Folder: CodeBase

4. Delete the selected files from the Code folder.



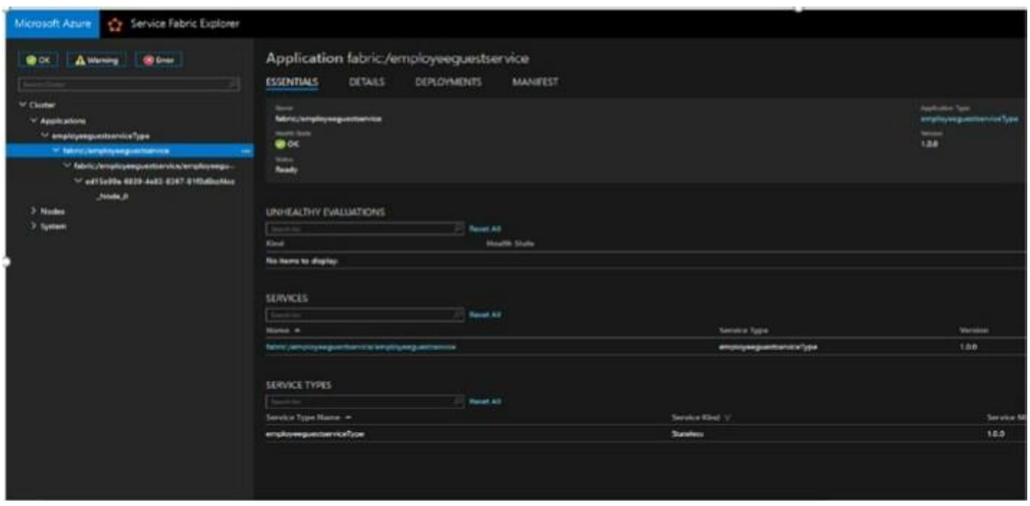
5. We also need to upload the runtime to run the JAR. Generally, it resides in the JDK installation folder (C:\ java-1.8.0-openjdk-1.8.0.191-1.b12.redhat.windows.x86_64). Paste it in the Code folder.



6. Open ServiceManisfest.xml and set the following values.

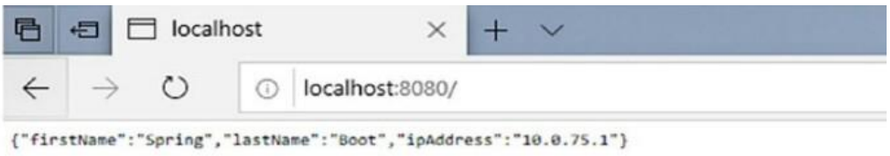
```
<EntryPoint>
<ExeHost>
 <Program>jre\bin\java.exe</Program>
<Arguments>-jar ..\..\employeespringservice-0.0.1-
SNAPSHOT.jar</Arguments>
<WorkingFolder>CodeBase</WorkingFolder>
 <!-- Uncomment to log console output (both stdout and stderr) to one of the
        service's working directories. -->
 <!-- <ConsoleRedirection FileRetentionCount="5"
FileMaxSizeInKb="2048"/> -->
      </ExeHost>
    </EntryPoint>
 </CodePackage>
<Resources>
```

<Endpoints>
<!-- This endpoint is used by the communication listener to obtain the port on which to
listen. Please note that if your service is partitioned, this port is shared withreplicas of different partitions that are placed in



your code. -->

<Endpoint Name="employeeguestserviceTypeEndpoint"
Protocol="http" Port="8080" Type="Input" />
</Endpoints>



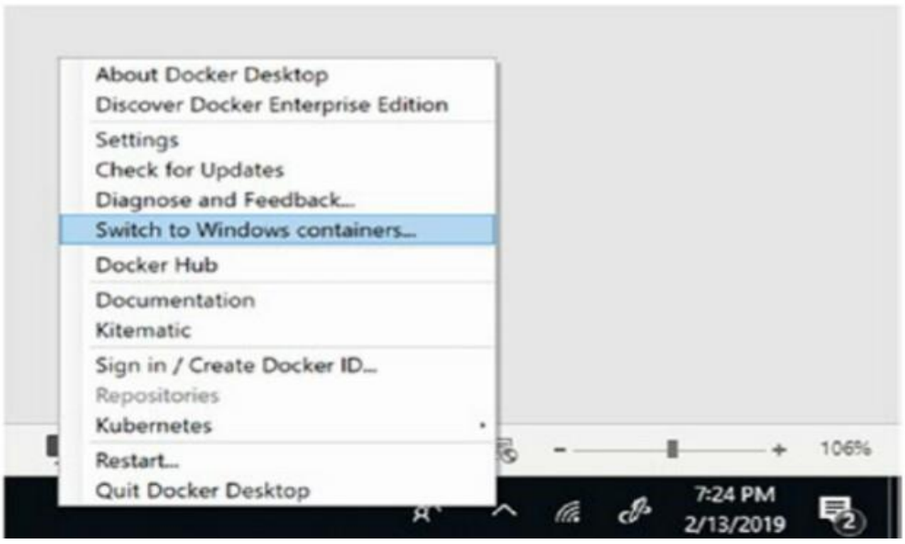
</Resources>
7. Make sure that the local Service Fabric cluster is up and running. Click F5. Browse the Service Fabric dashboard. The default URL is http://localhost:19080/Explorer/index.html. You see that your service is deployed.

8. Browse http://localhost:8080 to access your service. In servicemanifest.xml, we specified the service port as 8080; you can browse the same on 8080.

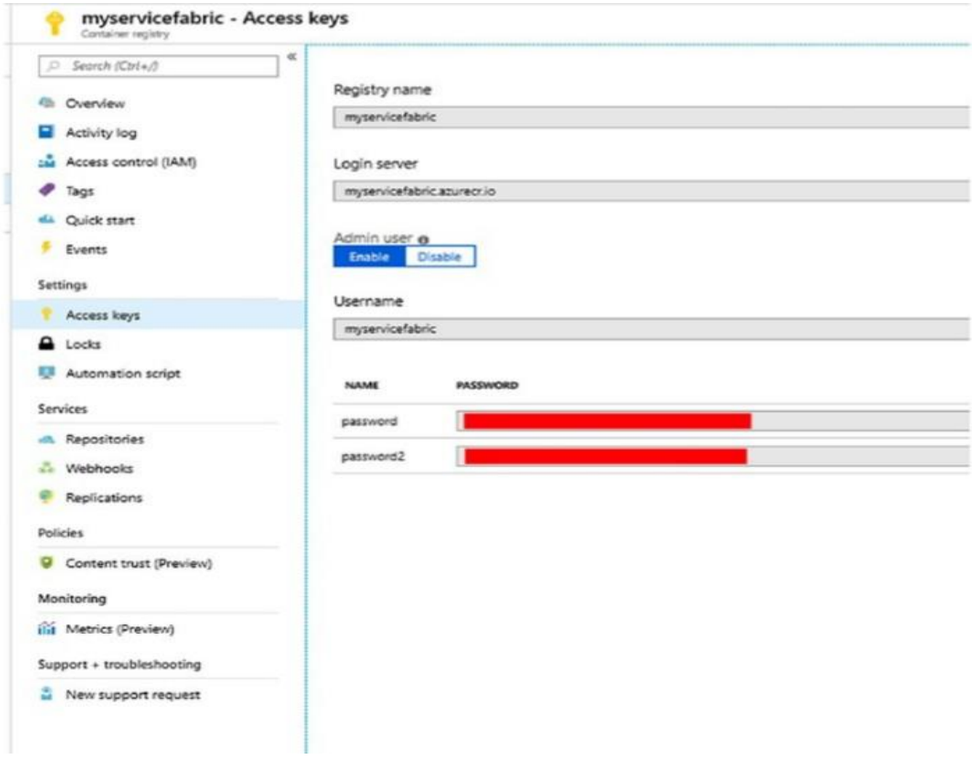
Deploy a Spring Boot Service as a Container

So far, we have deployed the service as a guest executable in Service Fabric. Now we will follow the steps to deploy the Spring service as a container in Service Fabric. This explains that in addition to creating stateful and stateless services, Service Fabric also orchestrates containers like any other orchestrator, even if the application wasn't developed on a Microsoft stack.

1. Open Visual Studio Code. Open the folder where employeespringservice exists. Open the Docker file.
2. Make sure that the name of the JAR file is correct.
3. Select Switch to Windows container… in Docker Desktop.

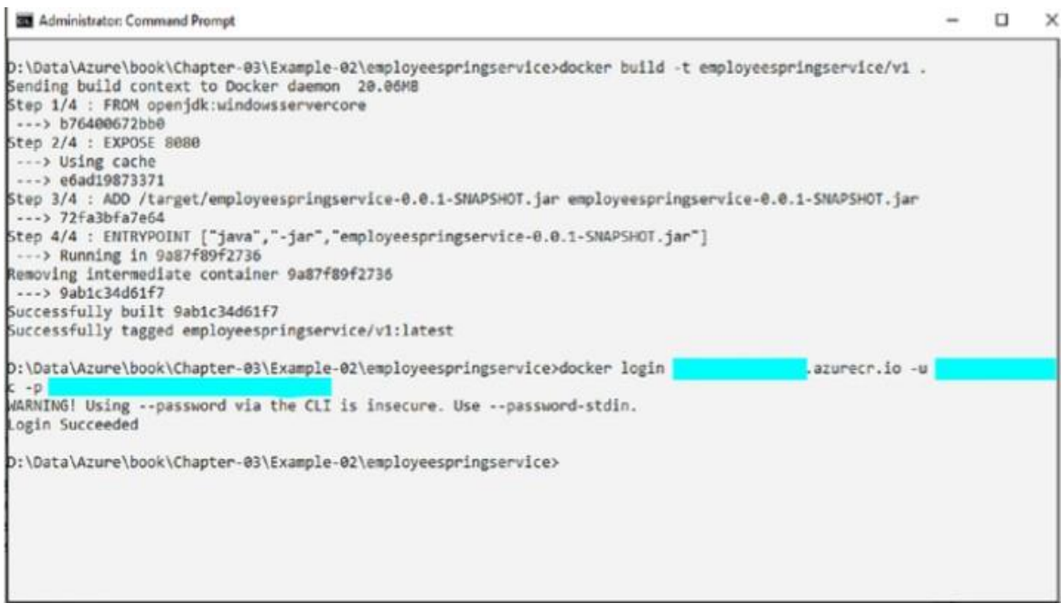


4. Create the Azure Container Registry resource in the Azure portal. Enable the admin user.



5. Open the command prompt in Administrative Mode and browse to the directory where the Docker file exists.
6. Fire the following command, including the period at the end. (This may take time because it downloads the Window Server core image from the Docker hub)

```
docker build -t employeespringservice/v1 .
```



Now the container image is available locally. You have to push the image to Azure Container

Registry.

1. Log in to Azure Container Registry using the admin username and password. Use the following command .

docker login youracr.azurecr.io -u yourusername -p yourpassword

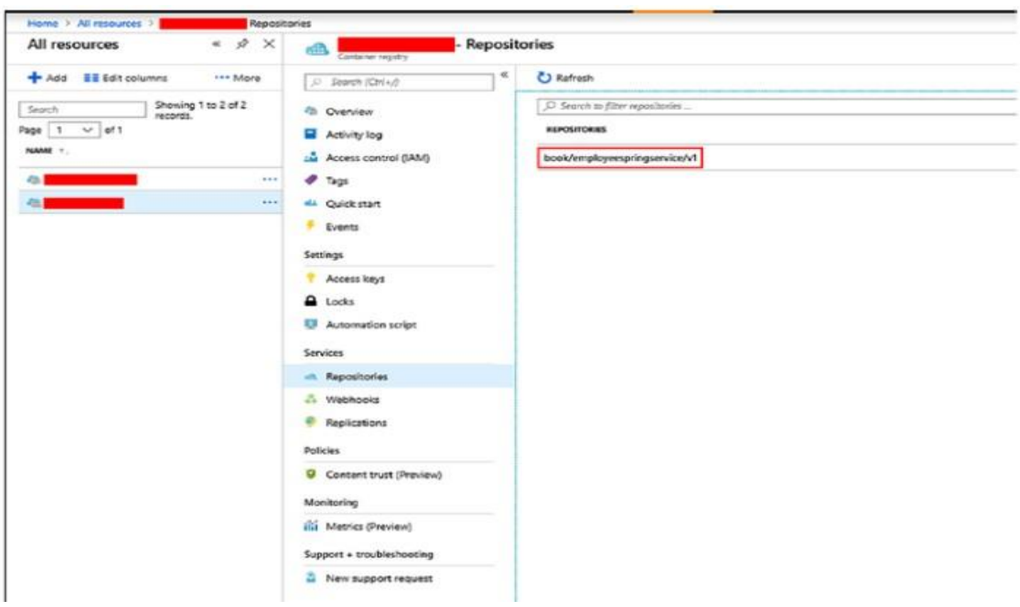
2. Fire the following commands to upload the image to ACR.

docker tag employeespringservice/v1 youracr.azurecr.io/book/

employeespringservice/v1
docker push myservicefabric.azurecr.io/book/
employeespringservice/v1

3. Log in to the Azure portal and check if you can see your image in Repositories.Since the container image is ready and uploaded in Azure Container Registry, let’s create a Service Fabric project to deploy the container to the local Service Fabric cluster.

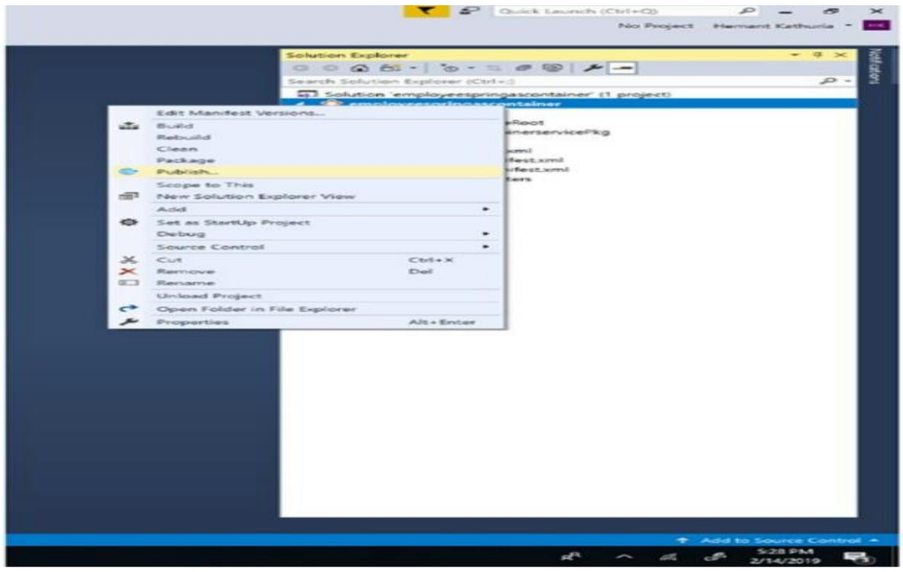
1. Launch Visual Studio 2017 as an administrator.
2. Click File ➤ New Project ➤ Select Cloud ➤ Service Fabric Application.
3. Name the application employeespringascontainer.



4. In New Service Fabric Service, select the following.
   a. Service Name: employeecontainerservice
   b. Image Name: youracr.azurecr.io/book/employeespringservice/v1

c. User Name: Your username in the Azure Container Registry
d. Host Port: 8090
e. Container Port: 8080

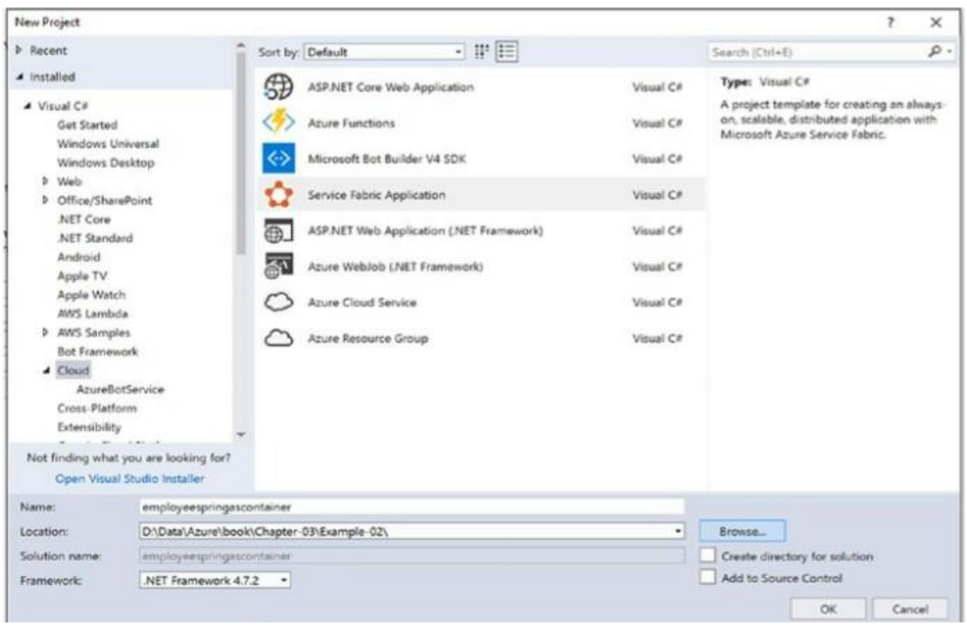
5. Once the solution is created, open the ApplicationManifest.xml. Specify the right password for the admin user. (Since this is a sample, we kept the password unencrypted; for real-word applications you have to encrypt the password



Now we are ready to build and deploy the

container to the local Service Fabric cluster. Since we have given the user information to download the image from Azure Container Registry, Visual Studio downloads and deploy the container to the local services fabric cluster.

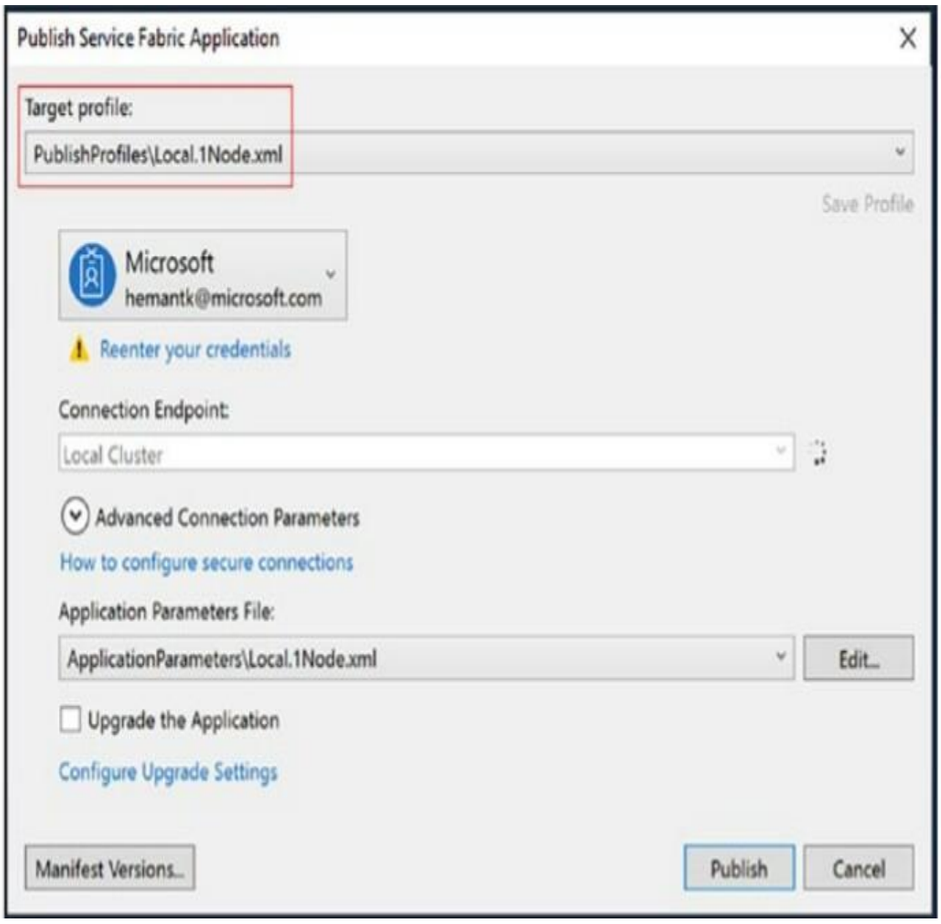
1. Right-click the Service Fabric project and publish.



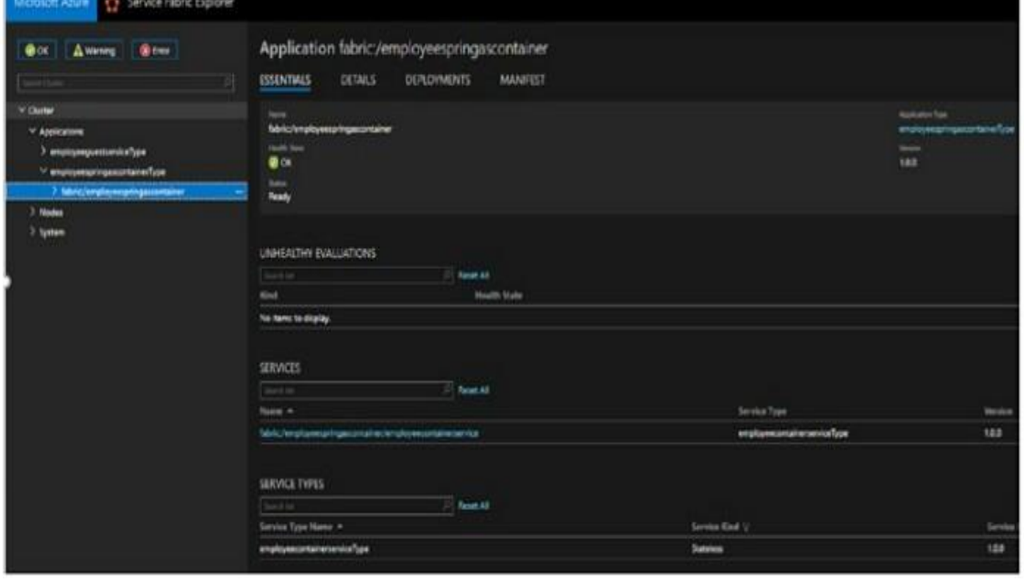
2. Select the local cluster profile to publish to the local Service Fabric cluster. To deploy to Azure, select the cloud profile. Make sure that the

Service Fabric cluster is up and ready in your subscription

.



3. Browse the Service Fabric dashboard. The default URL is http://localhost:19080/Explorer/index.html. Your service is deployed.



4. Browse to http://localhost:8090/ to access your service. You get the response which is served from the container run by Service Fabric.

PRACTICAL NO:3

Create an Asp.Net Web Core Api and Configure Monitoring.

Setting up the Development Environment
Let's set up.

1. Install Visual Studio 2017.

2. Install the Microsoft Azure Service Fabric SDK.

3. Create the Translator Text API in your Azure subscription and make a note of the access key.

4. Create an empty Azure SQL Database and keep the connection string with SQL Authentication handy.

5. Make sure that the Service Fabric local cluster on Windows is in a running state.

6. Make sure that the Service Fabric Azure cluster on Windows is in a running state.

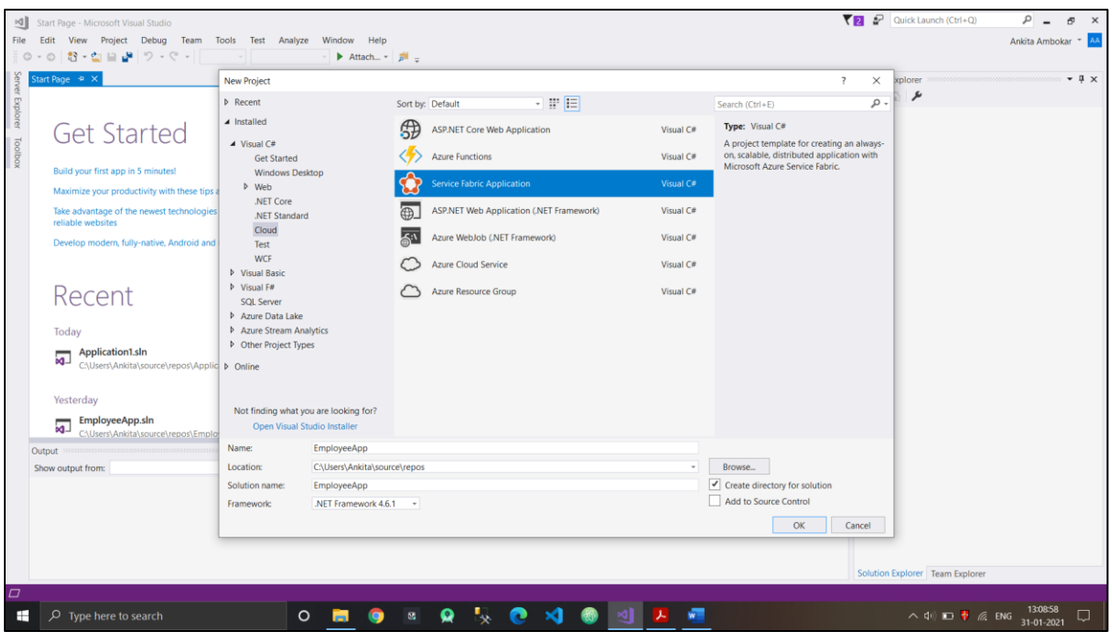
Create an ASP.NET Core Web API
Now let's start the API.

1. Launch Visual Studio 2017 as an administrator.

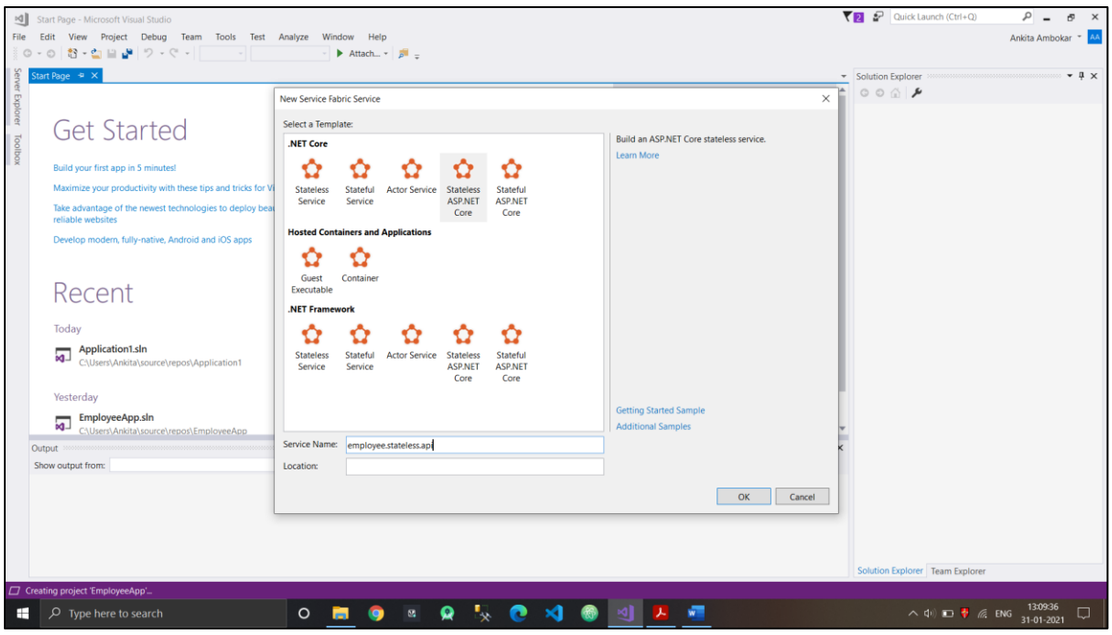
2. Create a project by selecting File → New → Project.

3. In the New Project dialog, choose Cloud →Service Fabric Application.

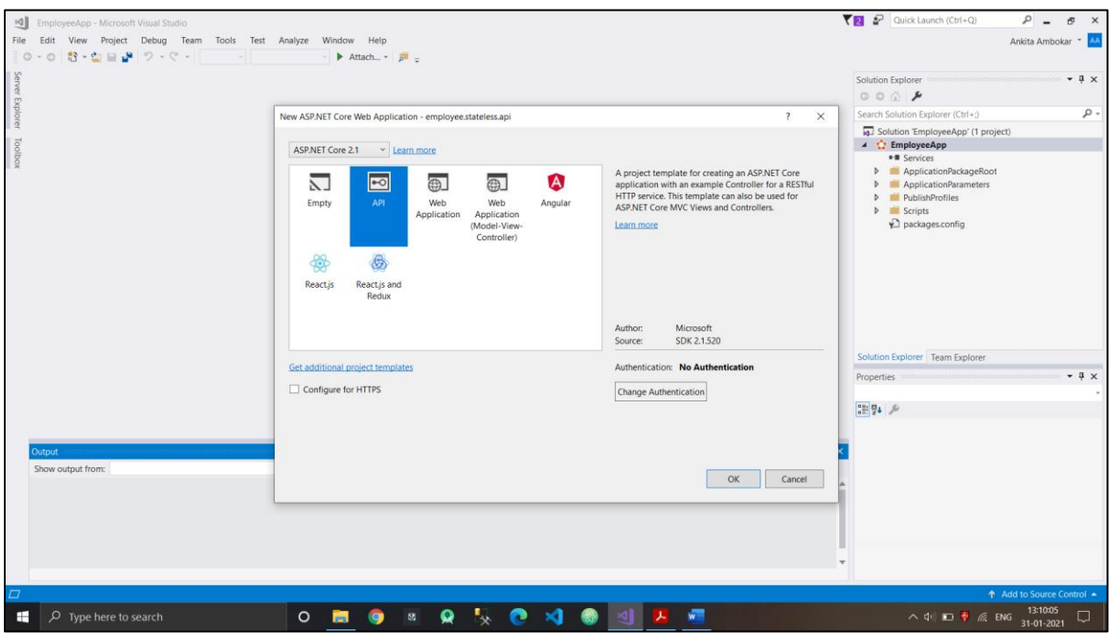
4. Name the Service Fabric application **EmployeeApp** and click OK.



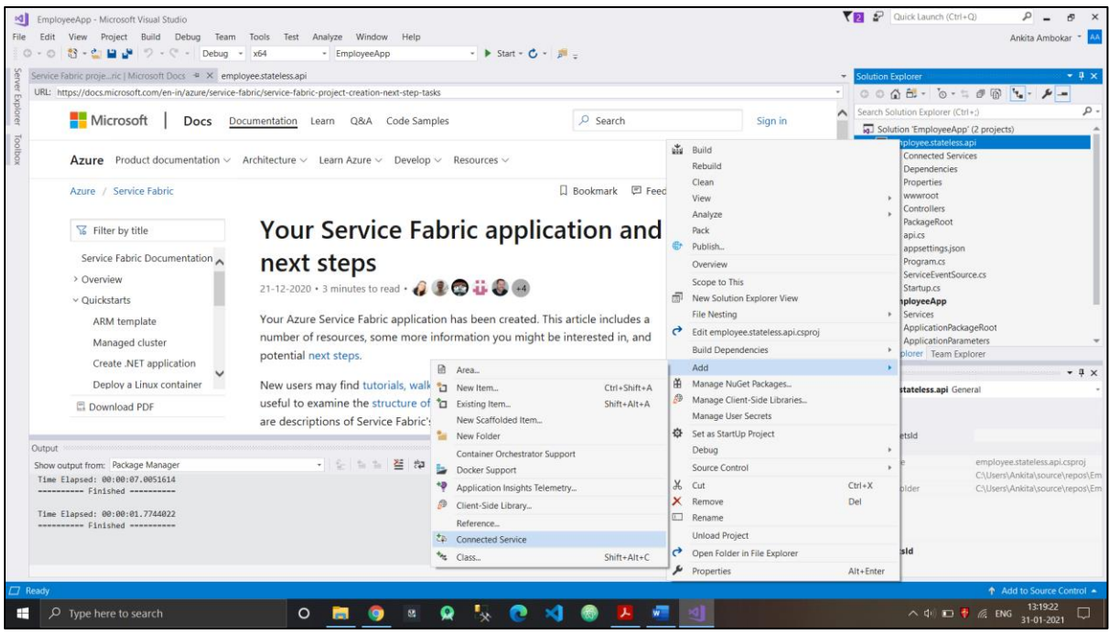
5. Name the stateless ASP.NET Core service **Employee.Stateless.Api** (as seen in Figure) and click OK.



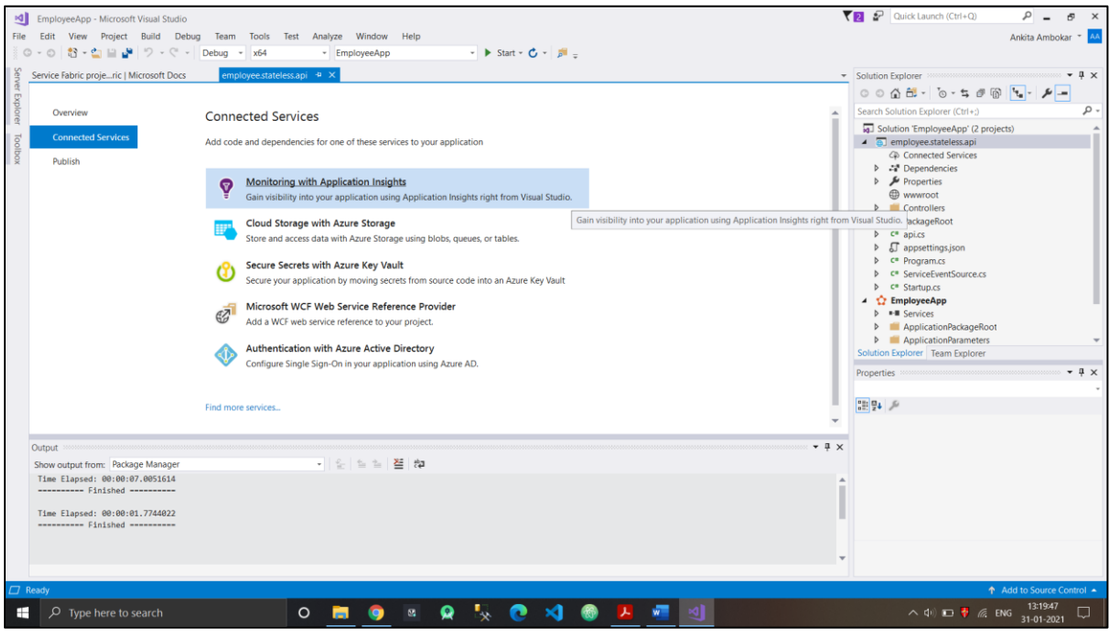
6. Choose the API and click OK. Make sure that ASP.NET Core 2.2 is selected, as shown in Figure.



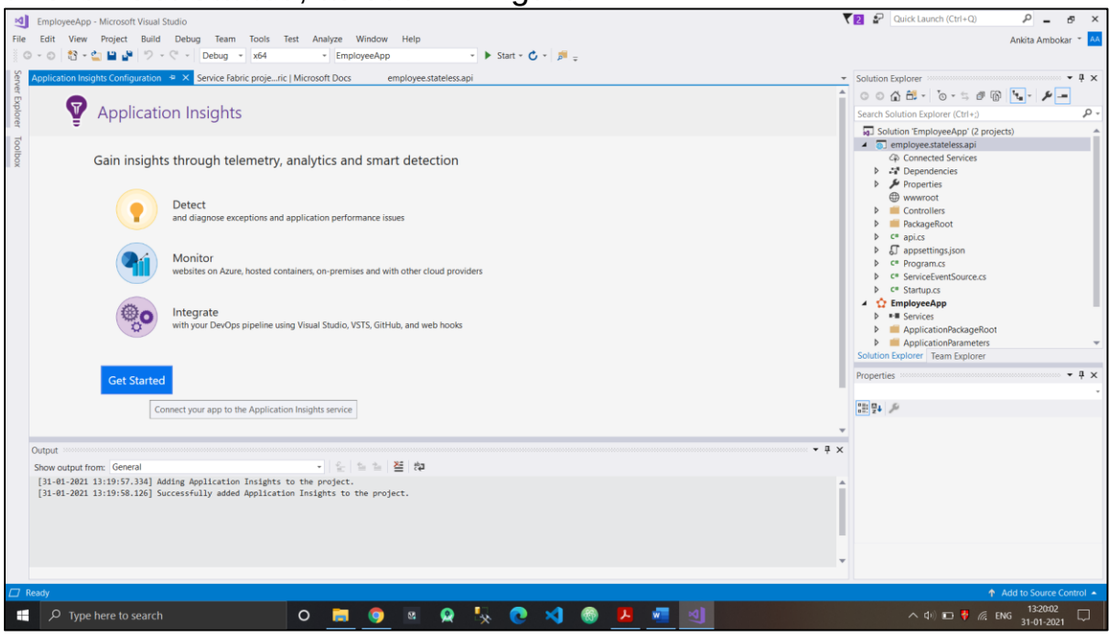
7. Right-click the employee.stateless.api project and select Add → Connected Service.



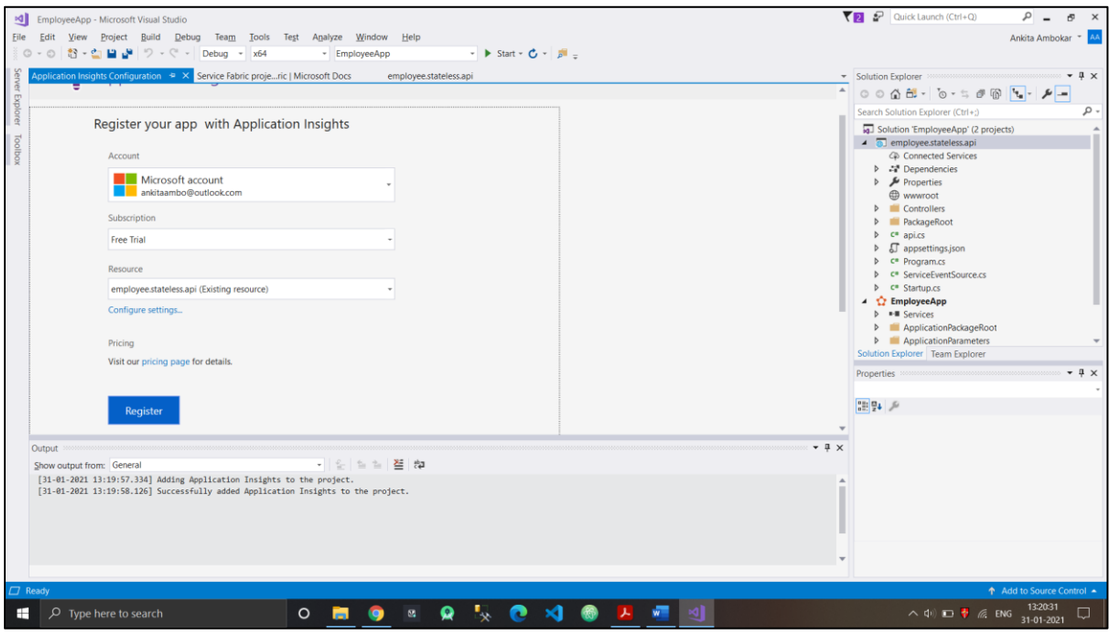
8. Choose Monitoring with Application Insights, as seen in Figure.



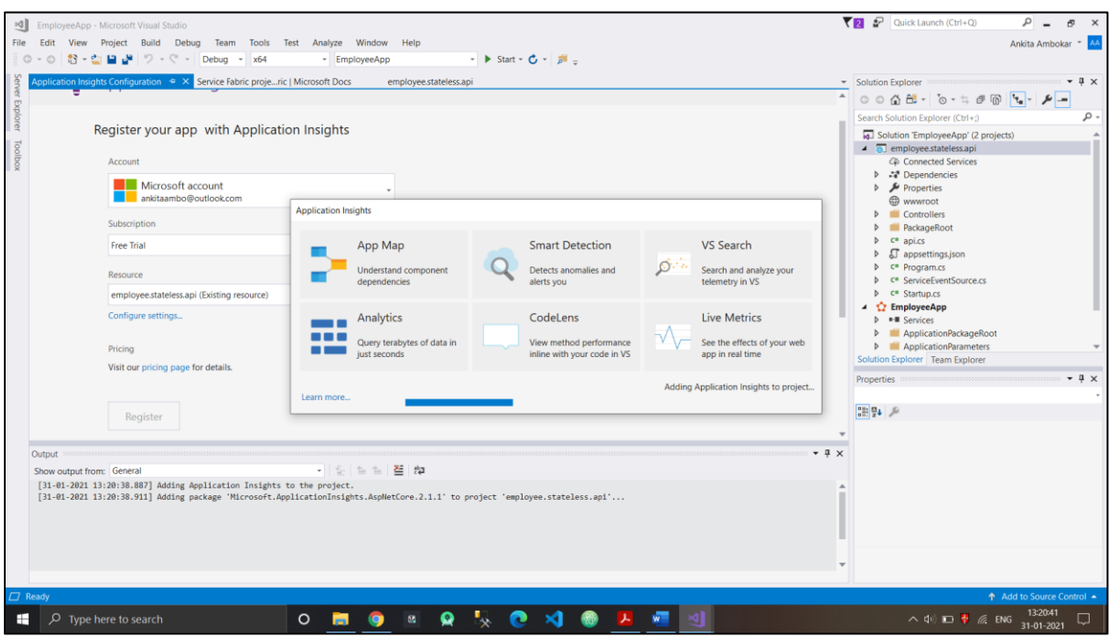
9. Click Get Started, as seen in Figure.



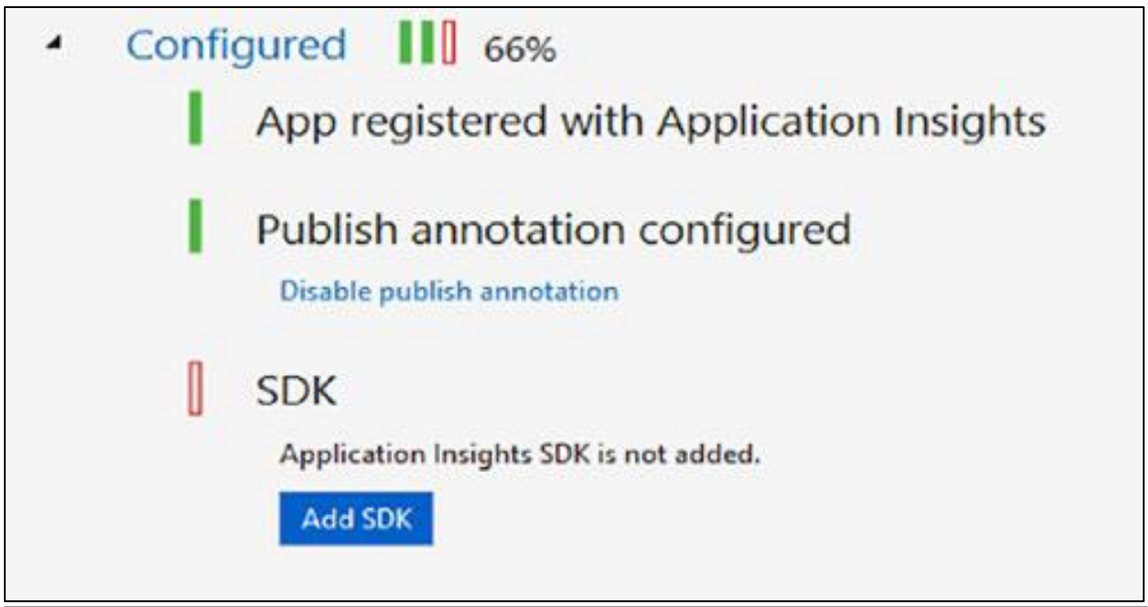
Choose the right Azure subscription and Application Insights resource. Once done, click Register, as seen in Figure.

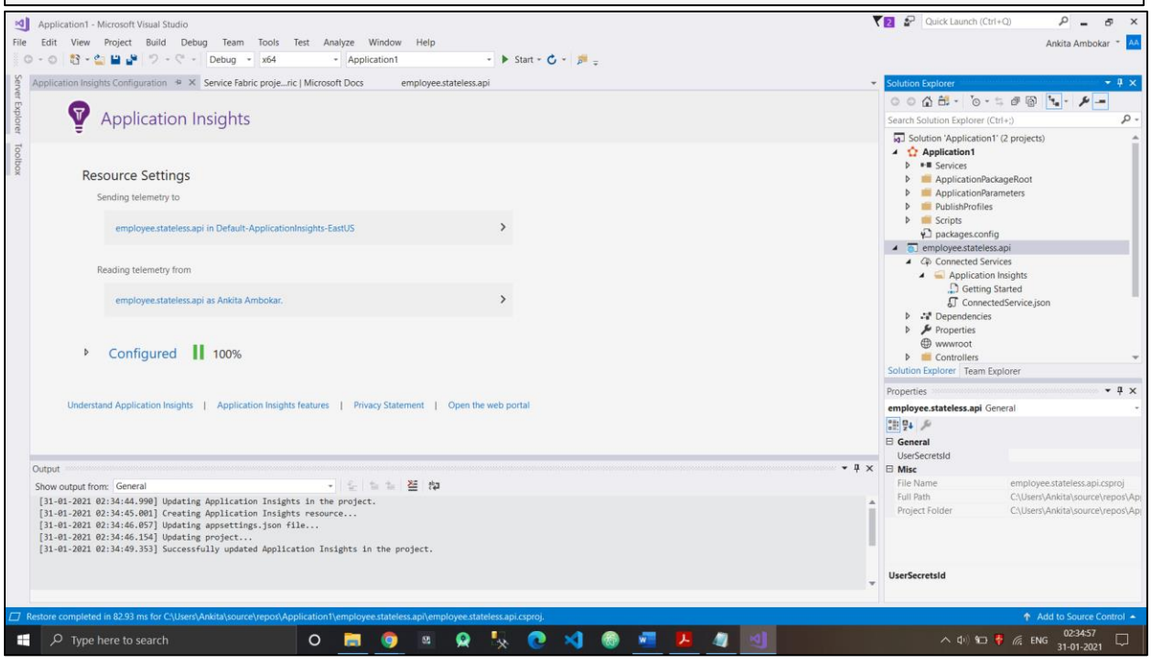


It takes a few minutes to create the Application Insights resource in your Azure subscription. During the registration process, you see the screen shown in Figure.



11. Once the Application Insights configuration is complete, you see the status as 100%. If you see the Add SDK button (as shown in Figure), click it to achieve 100% status, as seen in Figure.





12. To confirm the Application Insights configuration, check the instrumentation key in appsettings.json.

13. Right-click the employee.stateless.api project to add dependencies for the following NuGet packages.

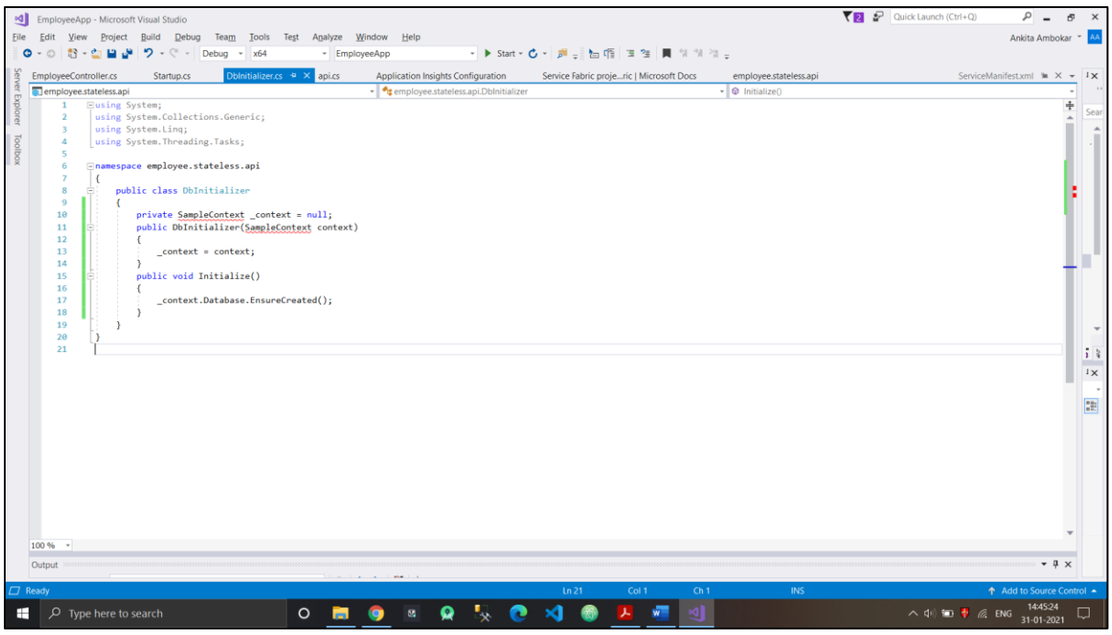
a. Microsoft.EntityFrameworkCore.SqlServer
b. Microsoft.ApplicationInsights.ServiceFabric.Native
c. Microsoft.ApplicationInsights.AspNetCore

We are done with the configuration. Now let's add EmployeeController.

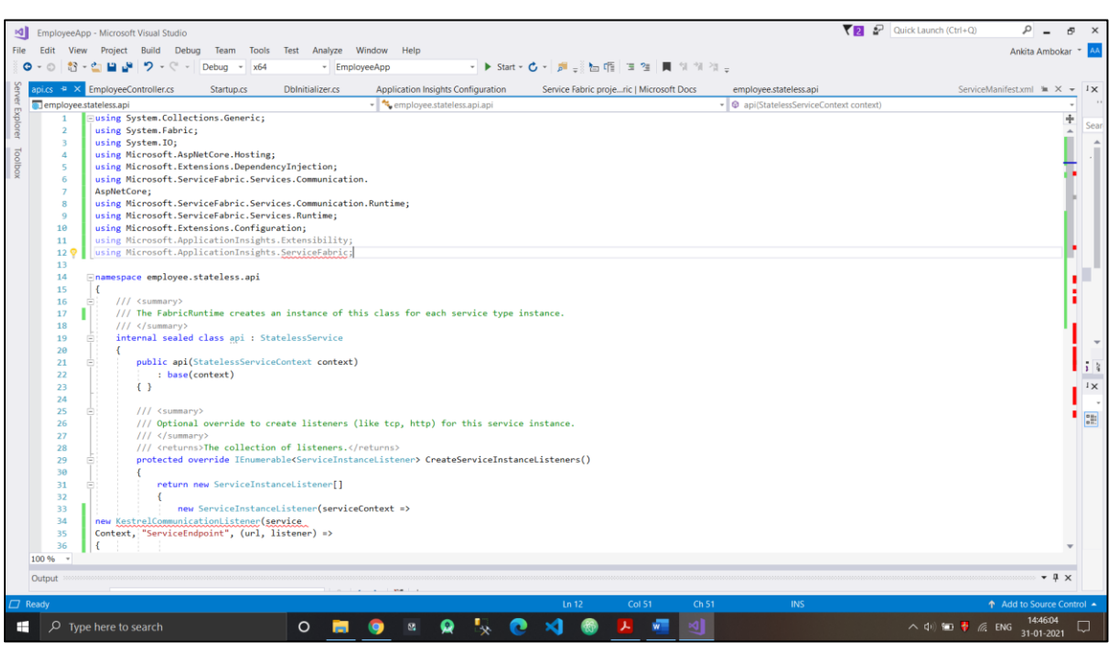
1. Right-click the employee.stateless.api project and a folder called Models. Add the following classes from the sources folder.

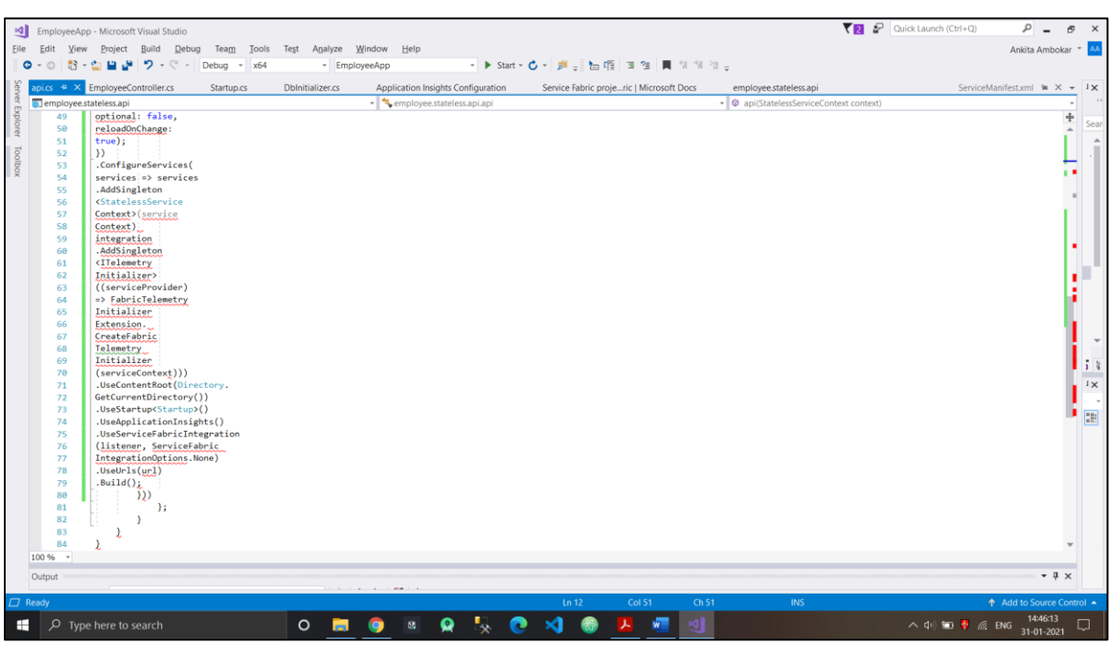
a. AppSettings.cs
b. Employee.cs
c. SampleContext.cs
d. TranslationResponse.cs

2. Right-click the employee.stateless.api project and add a file named DbInitializer.cs. Replace that content with the following content.

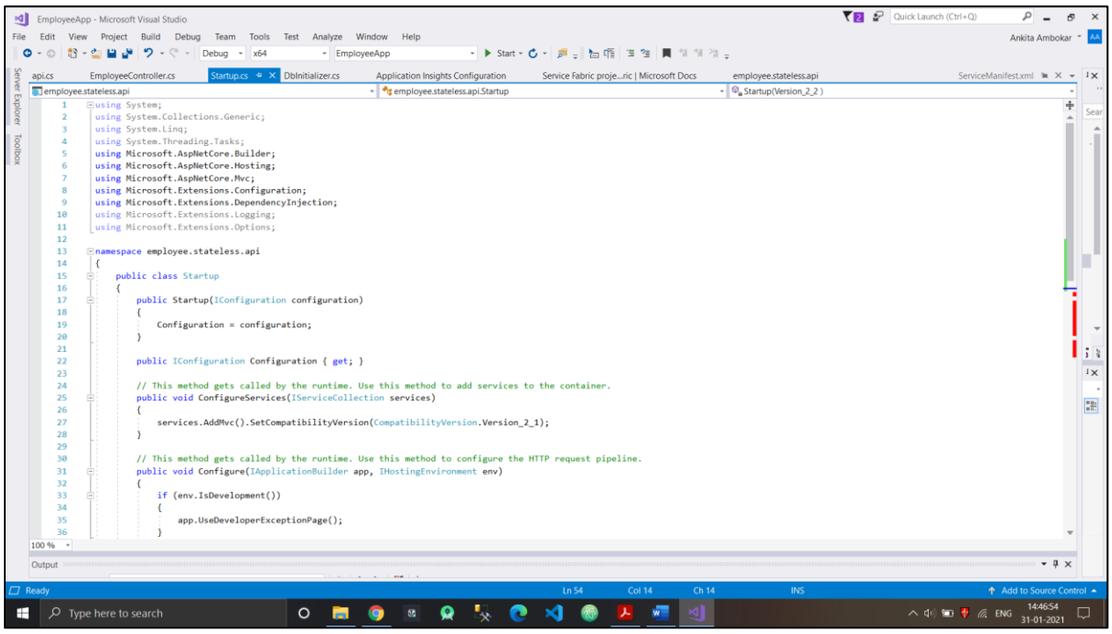


3. Open Api.cs and replace the contents of the CreateServiceInstanceListeners method with the following content.

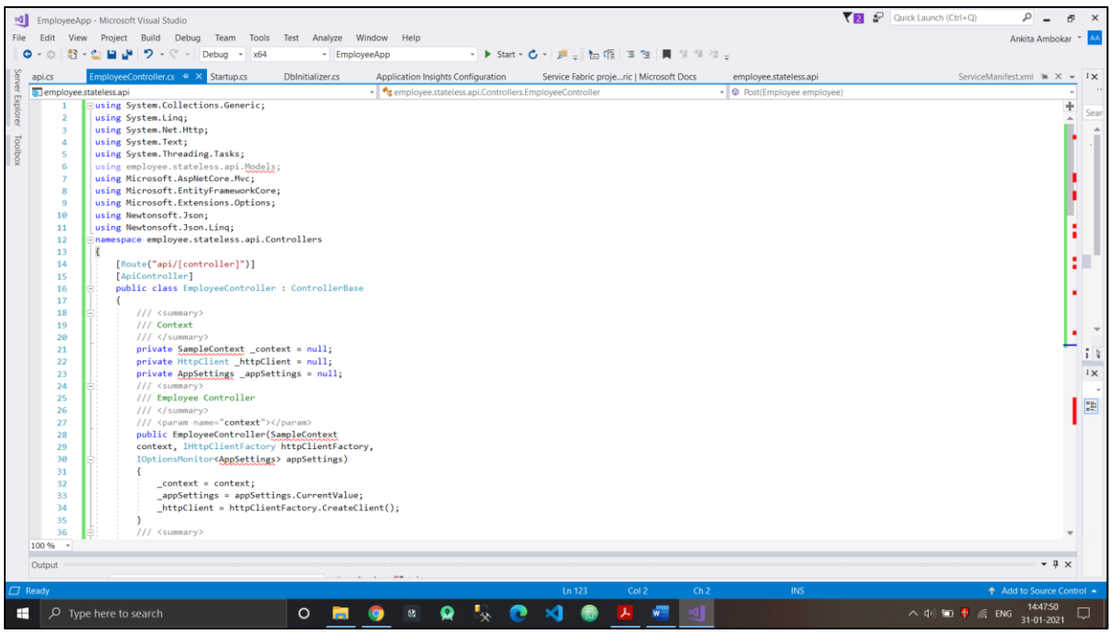


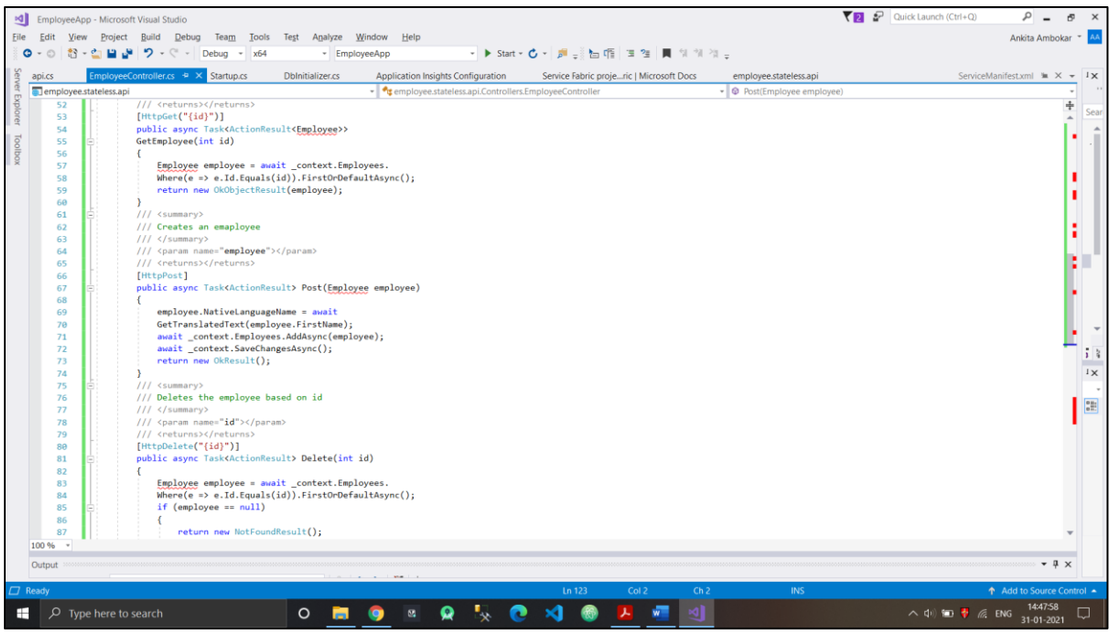


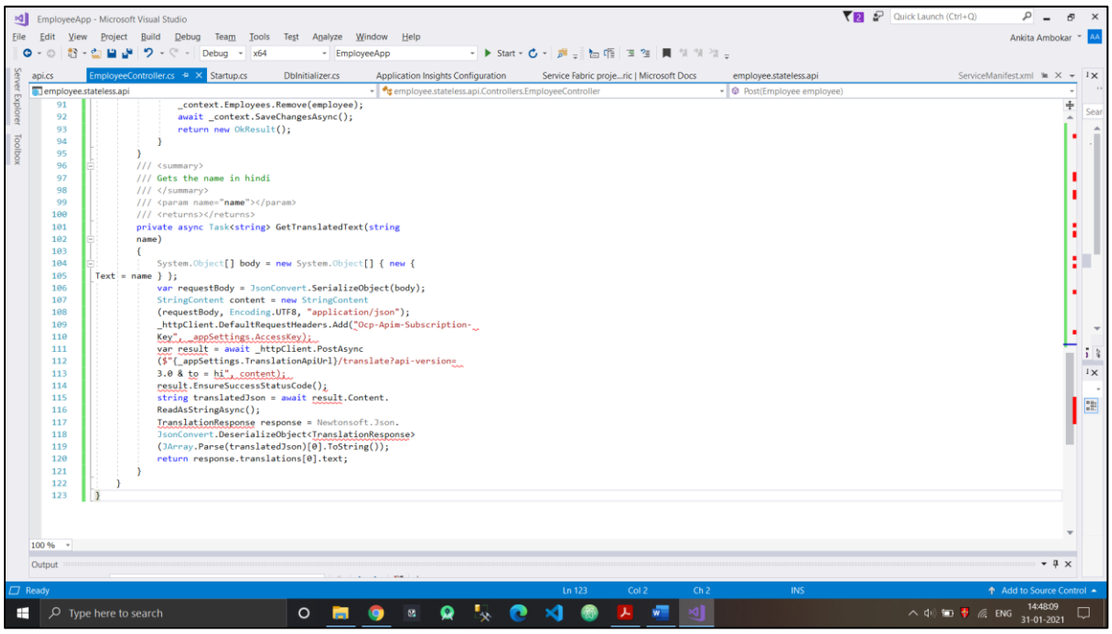
4. Open Startup.cs and replace the contents of the ConfigureServices method with the following content.



5. Right-click the controller folder in the employee.stateless.api project and add a controller called EmployeeController.cs. Replace that content with the following content.







6. Open AppSettings.json and make sure that the content looks similar to your connection strings.

```
{
"ConnectionStrings": {
"DefaultConnection": "Server=<<YOUR_SERVER>>;Database=
<<YOUR_DATABASE>>;User
ID=<<USER_ID>>;Password=<<PASSWORD>>
;Trusted_Connection=False;Encrypt=True;MultipleActiveResult
Sets=True;"
},
"AppSettings": {
"TranslationApiUrl": "https://api.cognitive.
microsofttranslator.com",
```

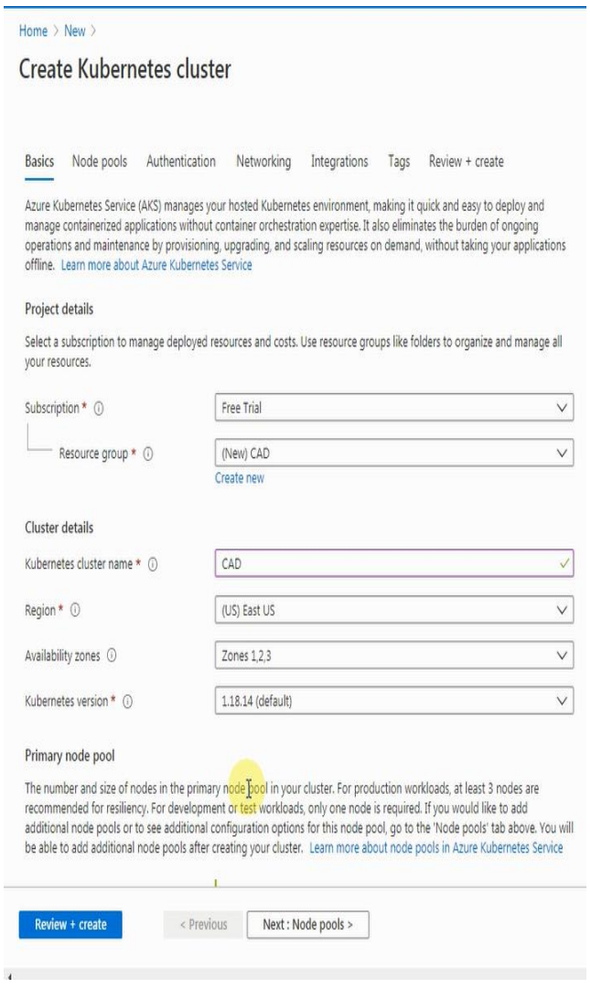
"AccessKey": "<<YOUR ACCESS KEY TO TRANSLATION API>>"
},
"Logging": {
"LogLevel": {
"Default": "Warning"
}
},
"AllowedHosts": "*",
"ApplicationInsights": {
"InstrumentationKey": "<<YOUR INSTRUMENTATION KEY OF YOUR APP INSIGHTS RESOURCE>>"
}

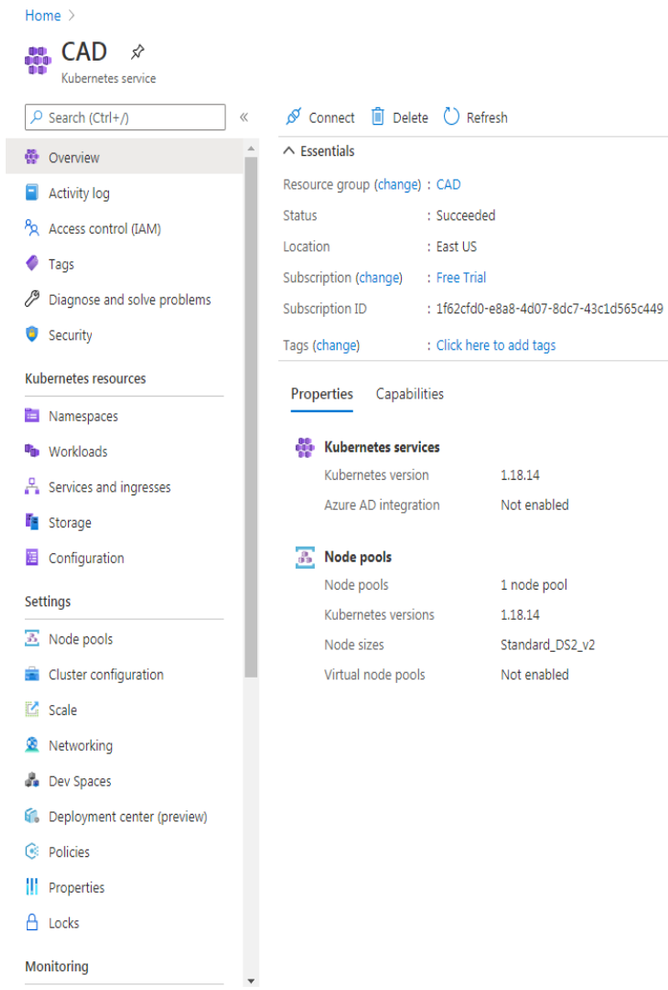
Practical No: 4

Practical No.4A
Create an Azure Kubernetes Service Cluster

Steps –

1. Sign in Azure Portal (https://portal.azure.com/)
2. Create Resource by clicking on Create Resource option.
3. Select Kubernetes Services
4. Enter the subscription, resource group, kubernetes, Cluster name, Region, Kubernetes version,& DNS Name prefix
5. Click on Review + Create Button
6. Click on Create Button





Practical No.4B - Enable Azure Dev Space on an AKS Cluster

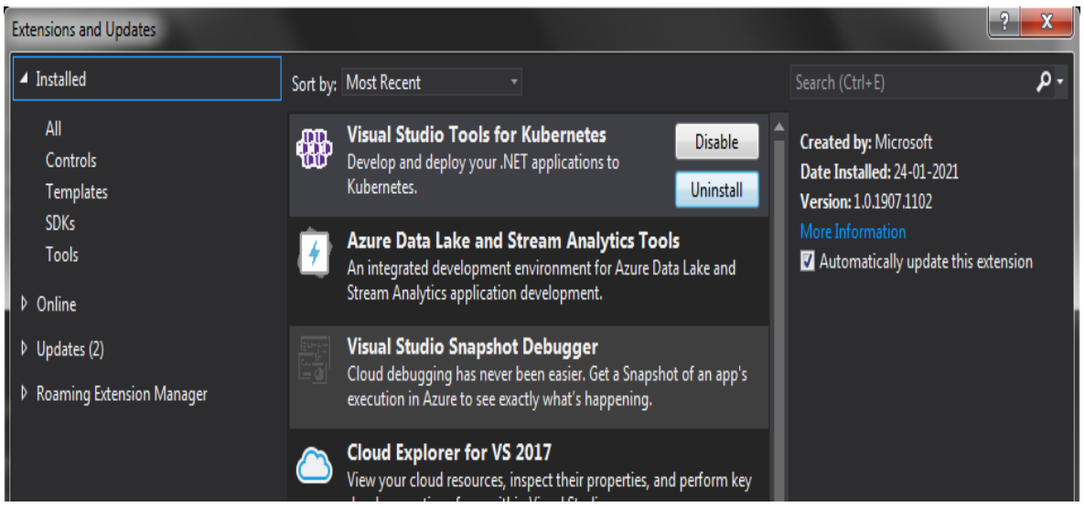
Steps –

1. Open Kubernetes Services
2. Click on Dev Space
3. Install Azure CLI
4. Open CMD
5. Enter command **AZ LOGIN**
6. Enter command
   az aks use-dev-spaces –n CAD–g CAD
7. Install Azure Dev Space

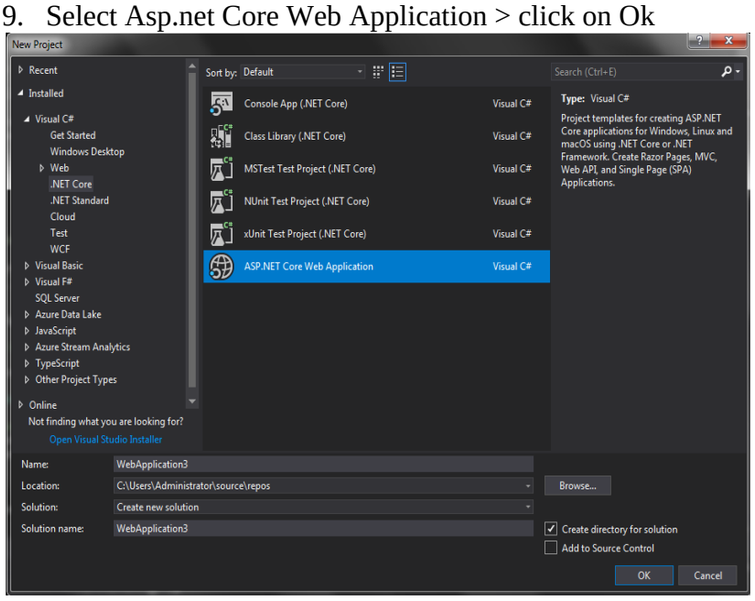
Practical No.4C - Configure Visual Studio to work with an azure kubernetes services Cluster

Steps –

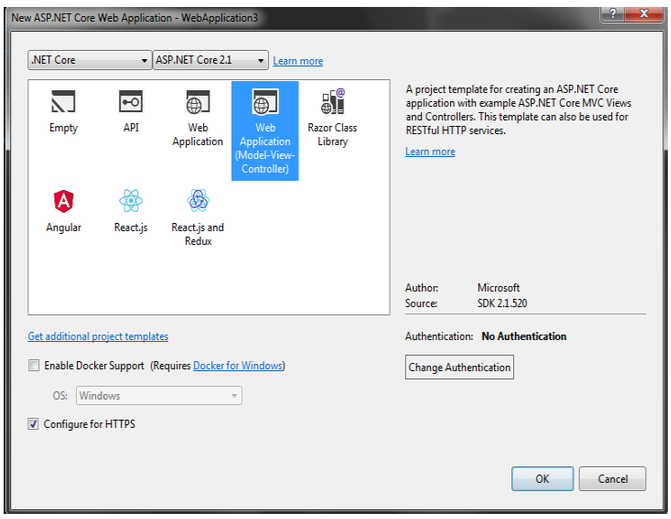
1. Install Visual Studio Enterprise 2017
2. Open Visual Studio 2017 >Tool > Extensions & Update
3. Search for Kubernetes Services tool
4. Click on Download
5. Close visual studio
6. click on Modify(install kubernetes tool extension)



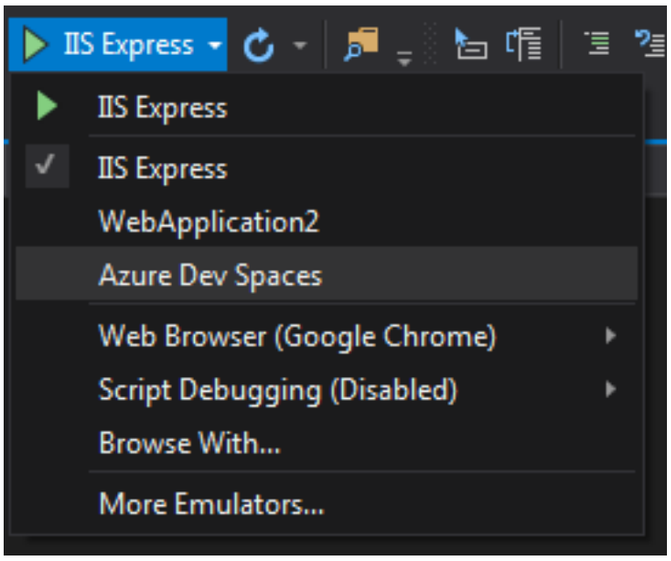
7. Open Visual studio
8. Click on new project
9. Select Asp.net Core Web Application > click on Ok



10. Select Model View Control > Click on OK



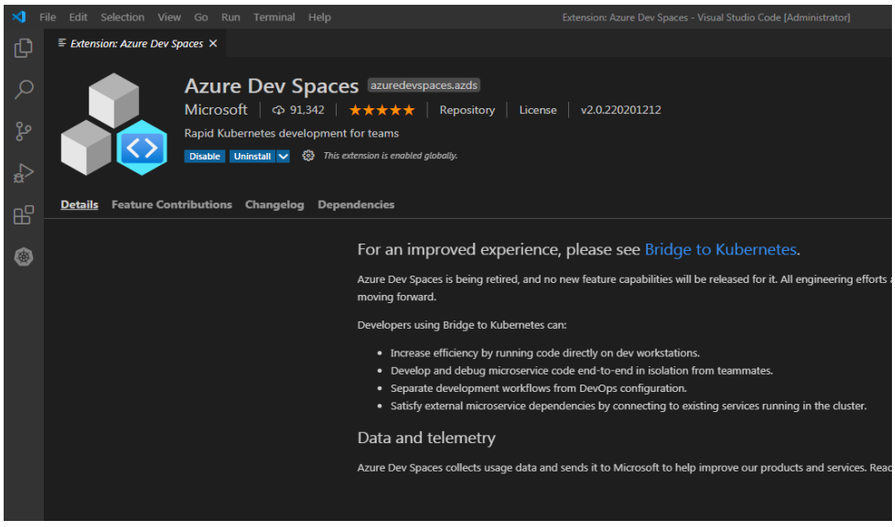
11. Click On Down Arrow of IIS Express
12. We can see option of Azure Dev Space



Practical No.4D - Configure Visual Studio Code to work with an azure kubernetes services Cluster

Steps –

1. Install visual studio code
2. Open extension window
3. Search for Azure Dev Space
4. Click Install



5. Install Azure CLI (https://docs.microsoft.com/en-us/cli/azure/install-azure-cli?view=azure-cli-latest)
6. Open cmd
7. Enter command **az Login**
8. Enter Command to install AZDS utility

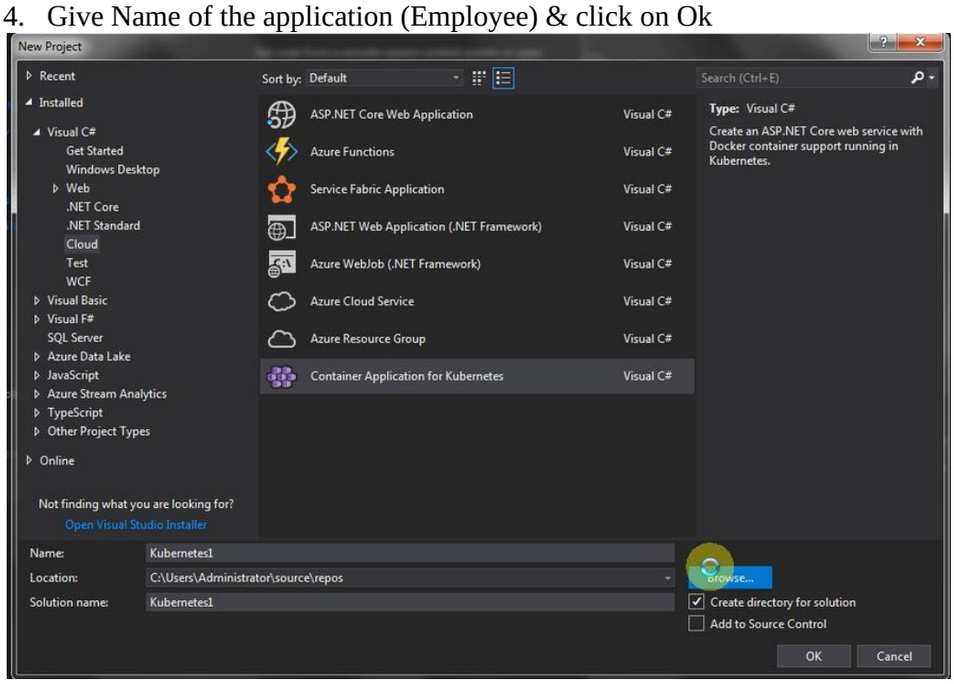
   az aks use-dev-spaces –n CAD –g CAD

Practical No.4E - Deploy Application on AKS

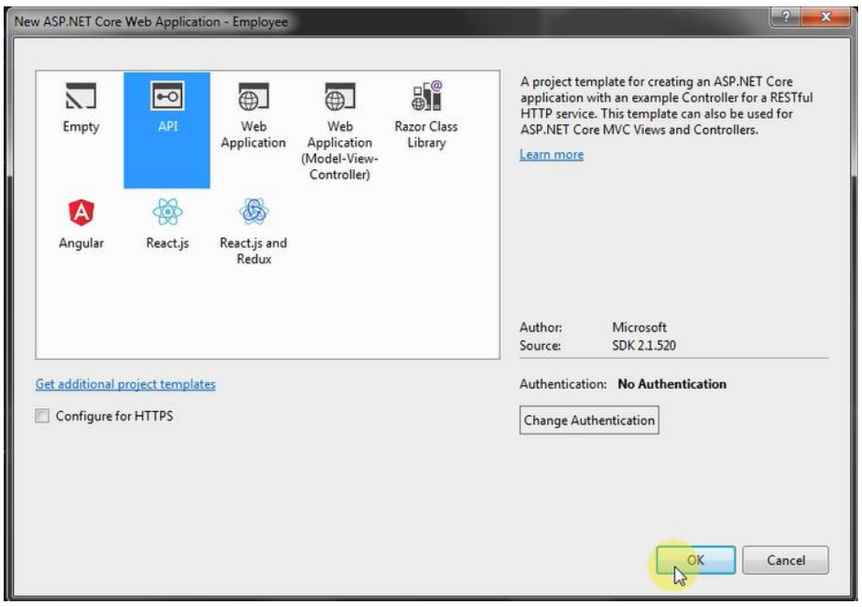
1.Core web API

Steps –

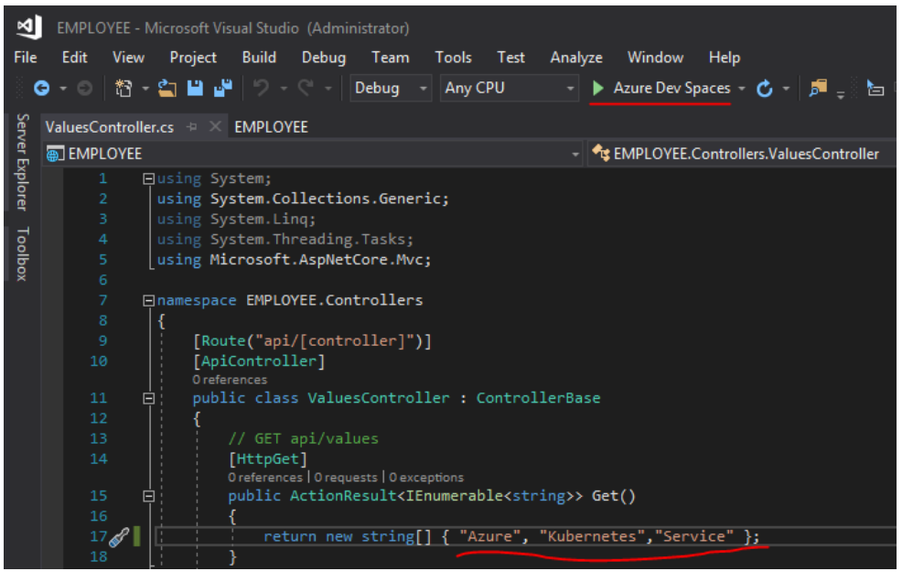
1. Open Visual Studio
2. Click on New project
3. Select Cloud Container Application for Kubernetes
4. Give Name of the application (Employee) & click on Ok



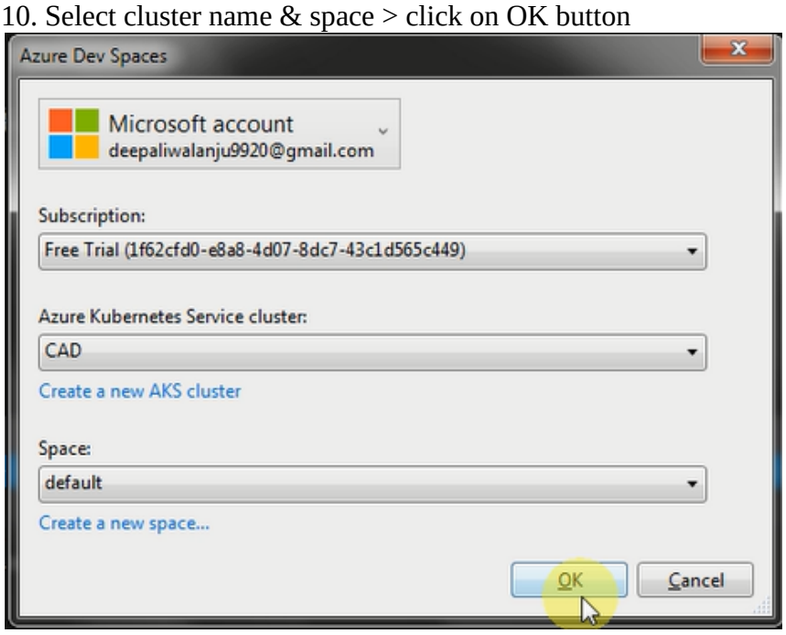
5. Select API option & click on OK button

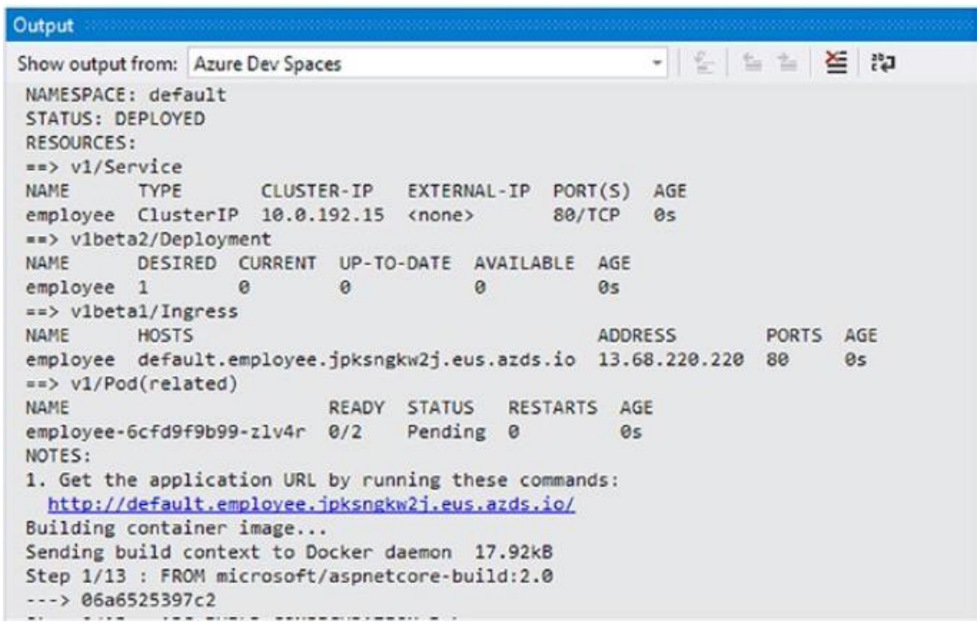


6. Make sure Azure Dev Space is selected in menu.
7. Open ValuesController.cs file
8. Edit line number 16 as shown in the screen shot



9. Save changes & press F5 button to run the application
10. Select cluster name & space > click on OK button





2.Node.js API

Steps –

1. Create MYAPP folder
2. Open visual studio code
3. Open folder MYAPP in visual studio code
4. Create new file server.js & pacakge.json
5. From windows explorer create PUBLIC folder in MYAPP folder
6. Now create new file using public folder by using visual studio code
7. Create file index.html & app.css
8. Open command palette from view menu (ctrl+shif+p)
9. Enter azure dev space & click on it
10. Click on configure
11. Click DEBUG icon on left & then click on LAUNCH SERVER(AZDS)
12. OUTPUT will display in Output window

Server.js

```
var express = require('express');
var app = express();
app.use(express.static(__dirname + '/public'));
app.get('/', function (req, res) {
res.sendFile(__dirname + '/public/index.html');
});
app.get('/api', function (req, res) {
res.send('Hello from webfrontend');
});
var port = process.env.PORT || 80;
var server = app.listen(port, function () {
console.log('Listening on port ' + port);
});
process.on("SIGINT", () => {
process.exit(130 /* 128 + SIGINT */);
});
process.on("SIGTERM", () => {
console.log("Terminating...");
server.close();
});
```

Package.json

```
{
"name": "webfrontend",
"version": "0.1.0",
"devDependencies": {
"nodemon": "^1.18.10"
},
"dependencies": {
"express": "^4.16.2",
```

```
"request": "2.83.0"
},
"main": "server.js",
"scripts": {
"start": "node server.js"
}
}
```

Index.html

```
<!doctype html>
<html ng-app="myApp">
<head>
<script src="https://ajax.googleapis.com/ajax/libs/
angularjs/1.5.3/angular.min.js"></script>
<script src="https://cdnjs.cloudflare.com/ajax/
libs/angular.js/1.5.3/angular-route.js"></script>
<script src="app.js"></script>
<link rel="stylesheet" href="app.css">
<link href="https://maxcdn.bootstrapcdn.
com/bootstrap/3.3.6/css/bootstrap.min.css"
rel="stylesheet" integrity="sha384-1q8mTJOASx8j1Au
+a5WDVnPi2lkFfwwEAa8hDDdjZlpLegxhjVME1fgjWPGmkzs7"
crossorigin="anonymous">
<!-- Uncomment the next line -->
<!-- <meta name="viewport" content="width=devicewidth,
initial-scale=1"> -->
</head>
<body style="margin-left:10px; margin-right:10px;">
<div ng-controller="MainController">
<h2>Server Says</h2>
<div class="row">
<div class="col-xs-8 col-md-10">
<div ng-repeat="message in messages
track by $index">
<span class="message">{{message}}</
span>
</div>
</div>
<div class="col-xs-4 col-md-2">
<button class="btn btn-primary"
ng-click="
sayHelloToServer()">Say It
Again</button>
</div>
</div>
</div>
</body>
</html>
```

APP.css

```
.message {
font-family: Courier New, Courier, monospace;
font-weight: bold;
}
```

OUTPUT

The Debug console shows the log output.

```
> Executing task: C:\Program Files\Microsoft SDKs\Azure\Azure
Dev Spaces CLI (Preview)\azds.exe up --port=50521:9229 --await-exec
--keep-alive <
Synchronizing files...4s
```

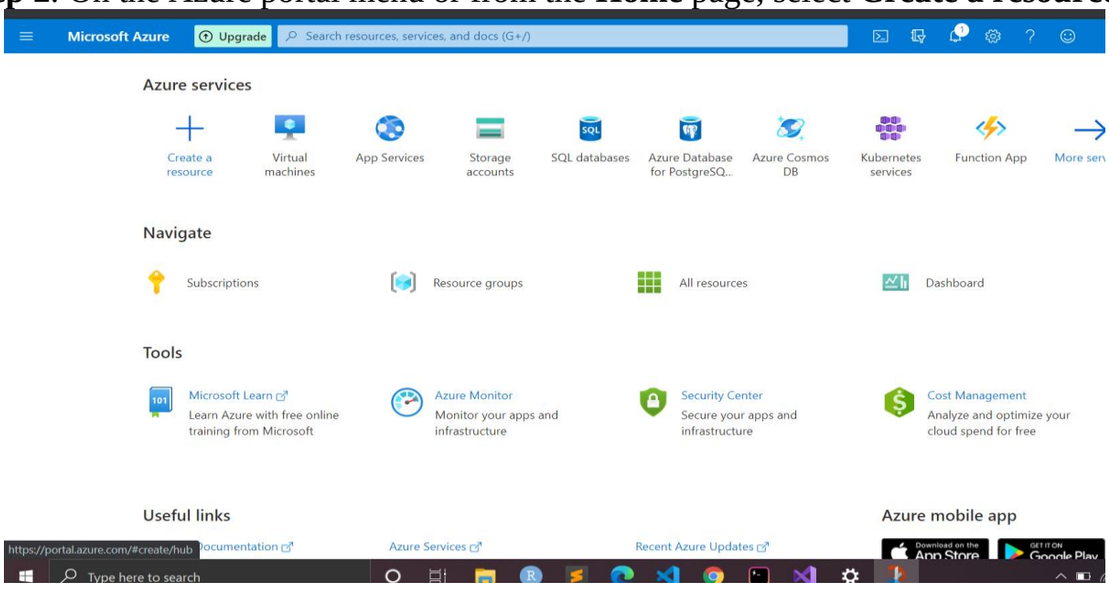
```
Using dev space 'new01' with target 'kuber01'
Installing Helm chart...2s
Waiting for container image build...29s
Building container image...
Step 1/8 : FROM node:lts
Step 2/8 : ENV PORT 80
Step 3/8 : EXPOSE 80
Step 4/8 : WORKDIR /app
Step 5/8 : COPY package.json .
Step 6/8 : RUN npm install
Step 7/8 : COPY . .
Step 8/8 : CMD ["npm", "start"]
Built container image in 45s
Waiting for container...52s
Service 'myapp' port 80 (http) is available via port forwarding
at http://localhost:50764
Terminal will be reused by tasks, press any key to close it.
```

PRACTICAL 5
Create an AKS cluster

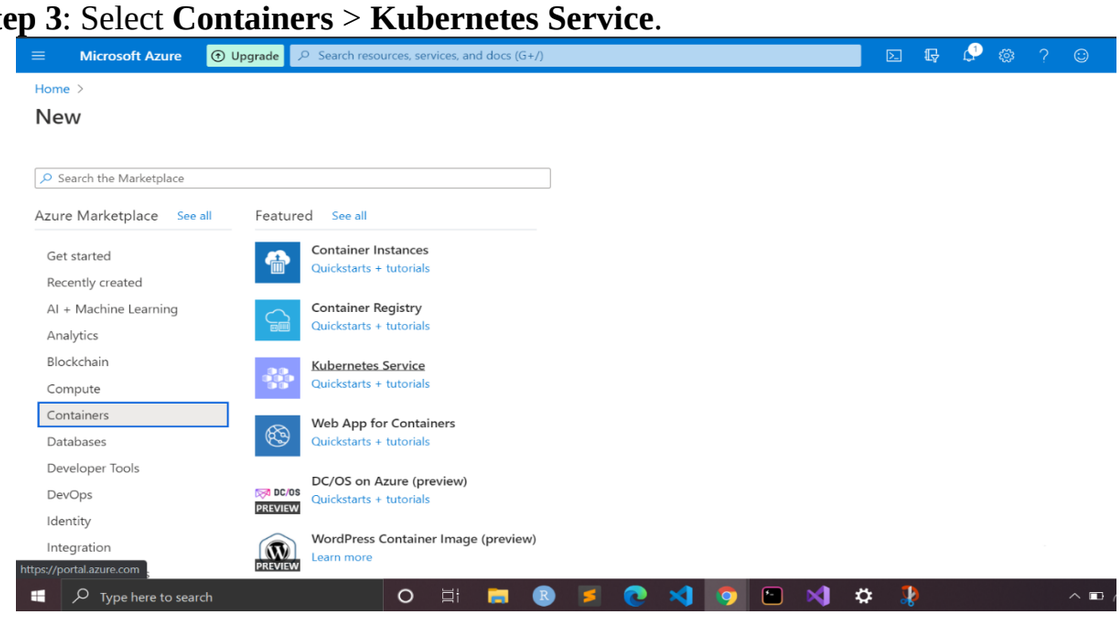
a. From the portal

Step 1: Sign in to the Azure portal at https://portal.azure.com.

Step 2: On the Azure portal menu or from the **Home** page, select **Create a resource**.



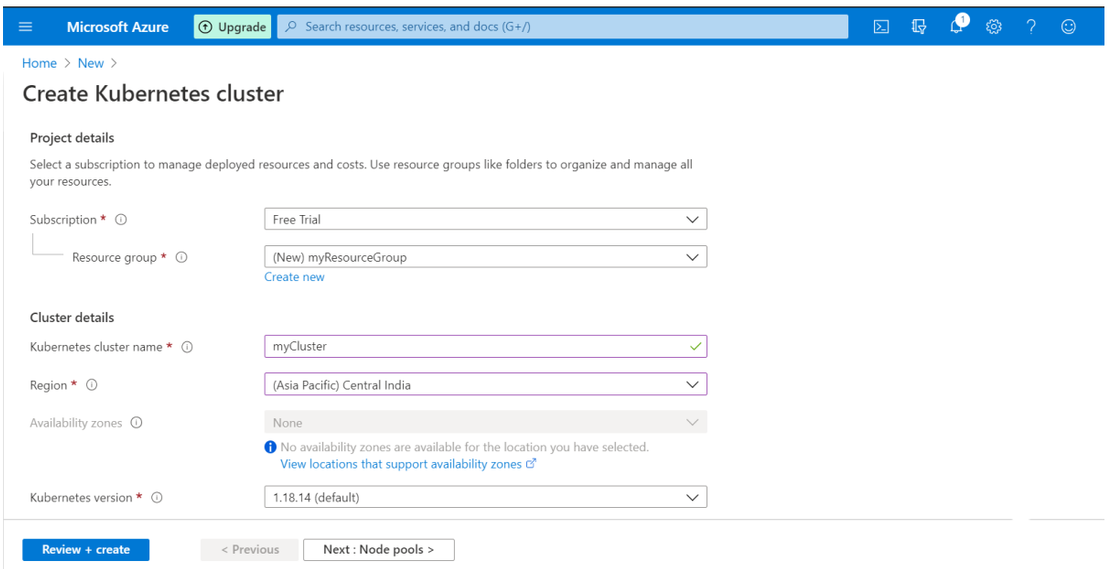
Step 3: Select **Containers** > **Kubernetes Service**.



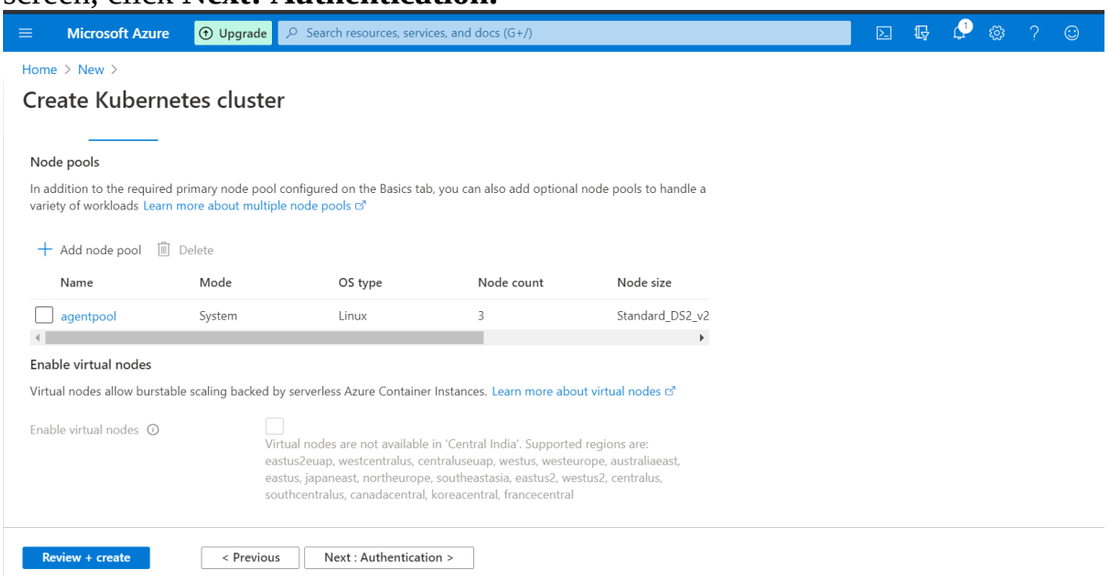
Step 4: On the **Basics** page, configure the following options:

- **Project details**: Select an Azure **Subscription**, then select or create an Azure **Resource group**, such as *myResourceGroup*.
- **Cluster details**: Enter a **Kubernetes cluster name**, such as *myCluster*. Select a **Region** and **Kubernetes version** for the AKS cluster.
- **Primary node pool**: Select a VM **Node size** for the AKS nodes. The VM size *can't* be changed once an AKS cluster has been deployed. - Select the number of nodes to deploy into the cluster. Set **Node count** to *1*. Node count *can* be adjusted after the cluster has been deployed.

Select Next: Node pools when complete.

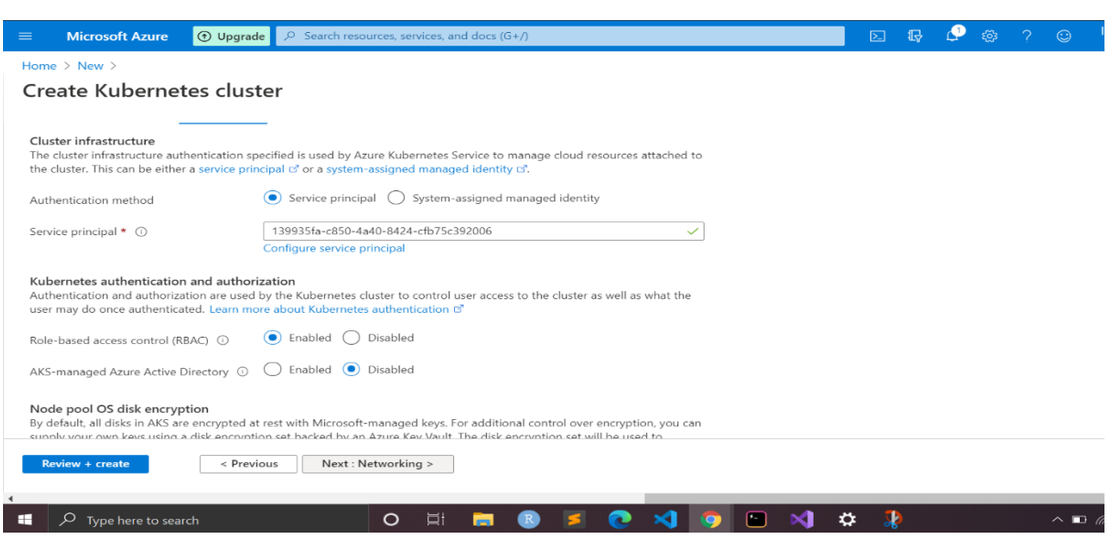


Step 5: On the **Node pools** page, keep the default options. At the bottom of the screen, click **Next: Authentication.**



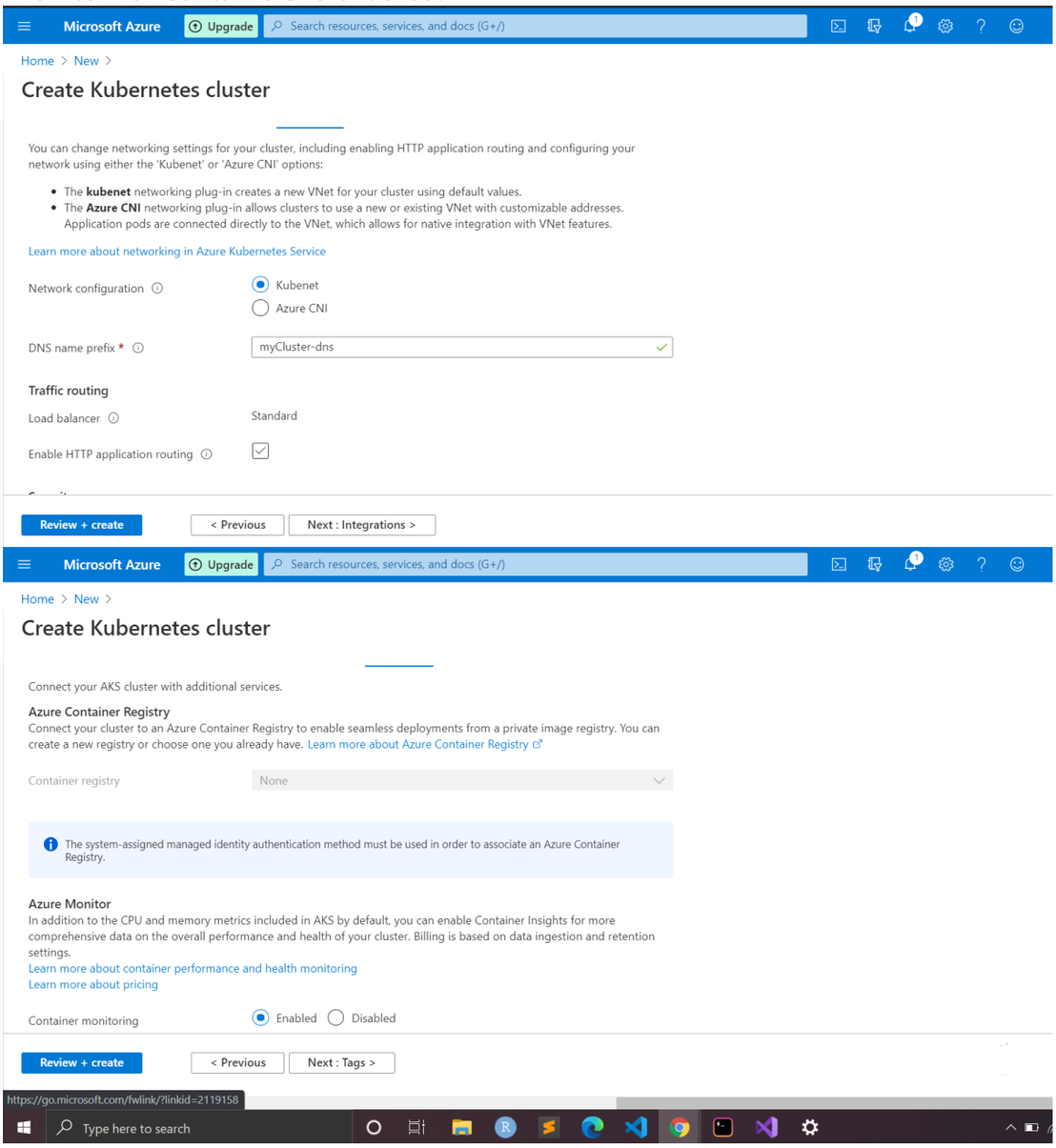
Step 6: On the **Authentication** page, configure the following options:

- Create a new service principal by leaving the **Service Principal** field with **(new) default service principal**. Or you can choose *Configure service principal* to use an existing one. If you use an existing one, you will need to provide the SPN client ID and secret.
- Enable the option for Kubernetes role-based access control (Kubernetes RBAC). This will provide more fine-grained control over access to the Kubernetes resources deployed in your AKS cluster

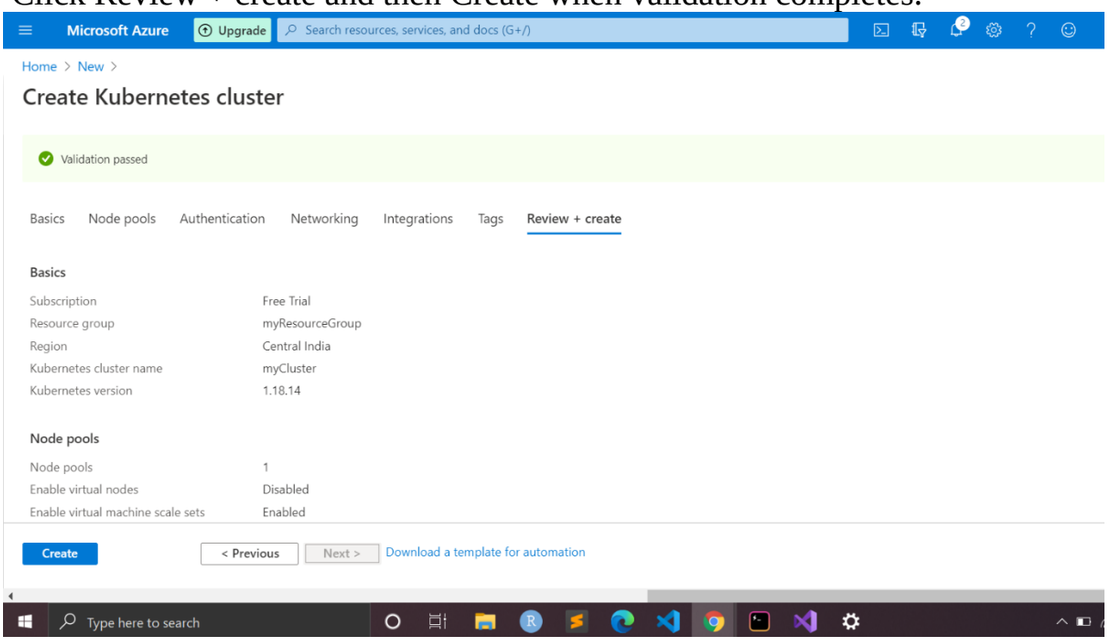


Step 7: By default, *Basic* networking, Integrations and tags is used, and Azure

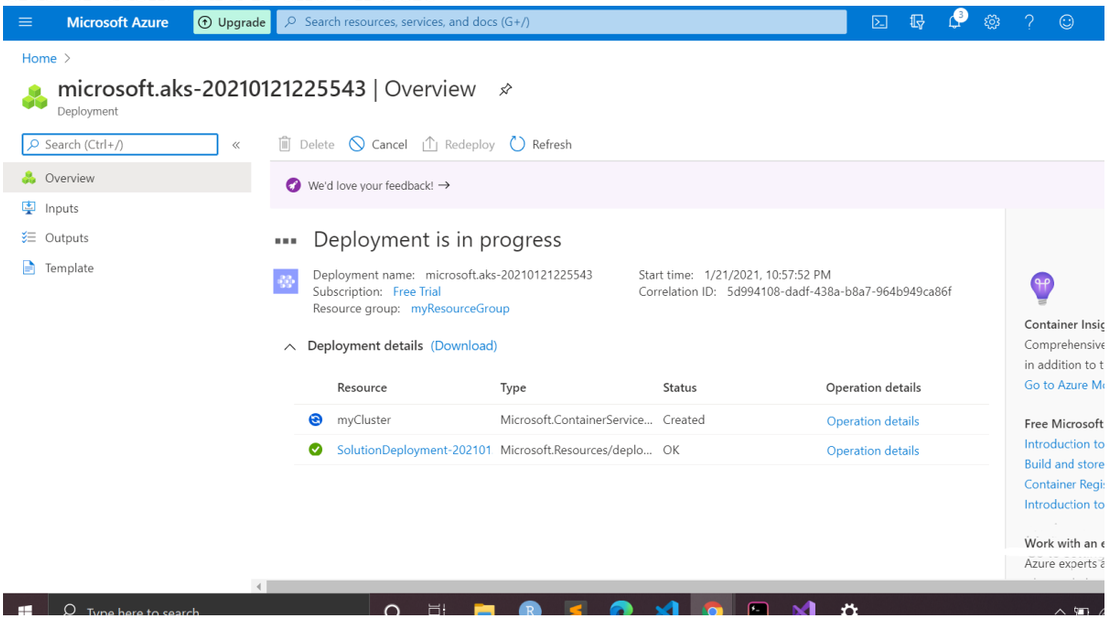
Monitor for containers is enabled.

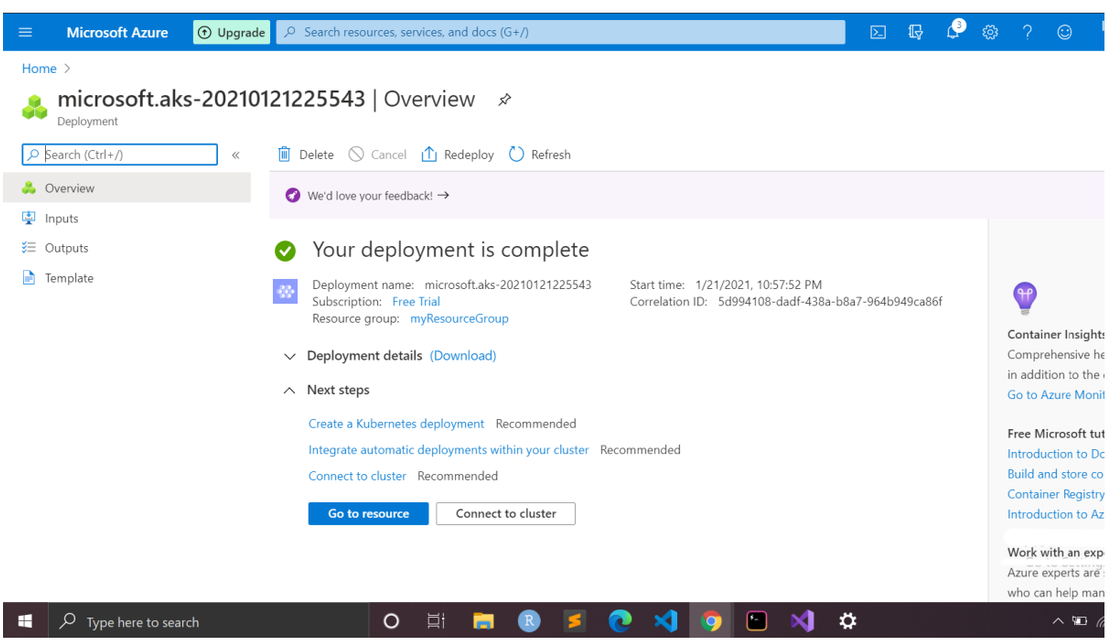


Click Review + create and then Create when validation completes.



Step 8: It takes a few minutes to create the AKS cluster. When your deployment is complete, click Go to resource, or browse to the AKS cluster resource group, such as *myResourceGroup*, and select the AKS resource, such as *myCluster*. The AKS cluster dashboard is shown below:

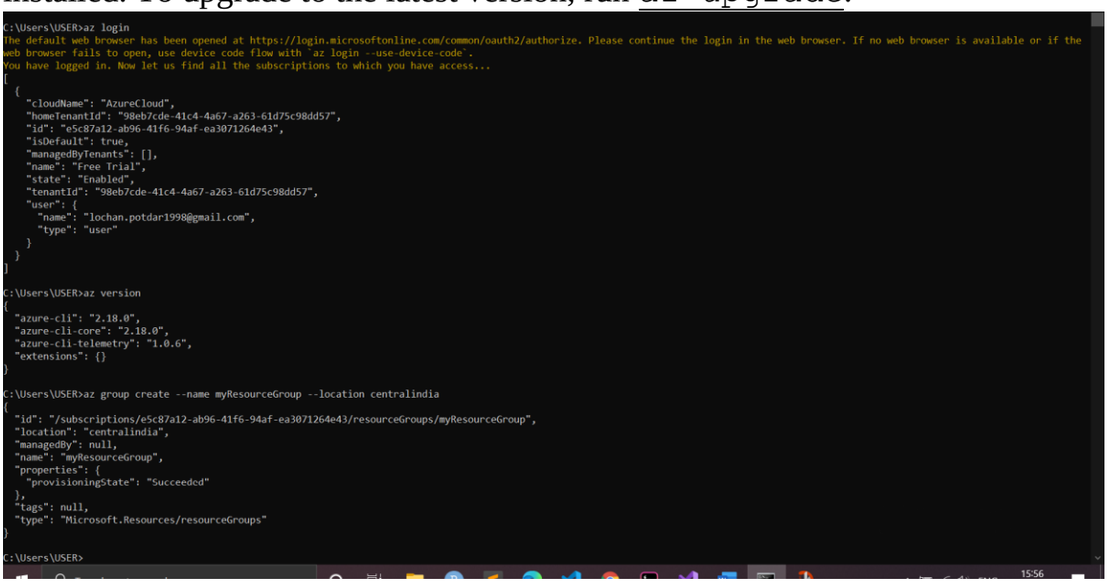




b. From azure CLI

Step 1: Install the Azure CLI to run CLI reference commands.
Step 2: Sign in to the Azure CLI by using the `az login` command. To finish the authentication process, follow the steps displayed in your terminal.
Step 3: Run `az version` to find the version and dependent libraries that are

installed. To upgrade to the latest version, run `az upgrade`.



Step 4: An Azure resource group is a logical group in which Azure resources are deployed and managed. When you create a resource group, you are asked to specify a location. This location is where resource group metadata is stored, it is also where your resources run in Azure if you don't specify another region during resource creation. Create a resource group using the `az group create` command.

Step 5: The following example creates a resource group named myResourceGroup in the centralindia location.

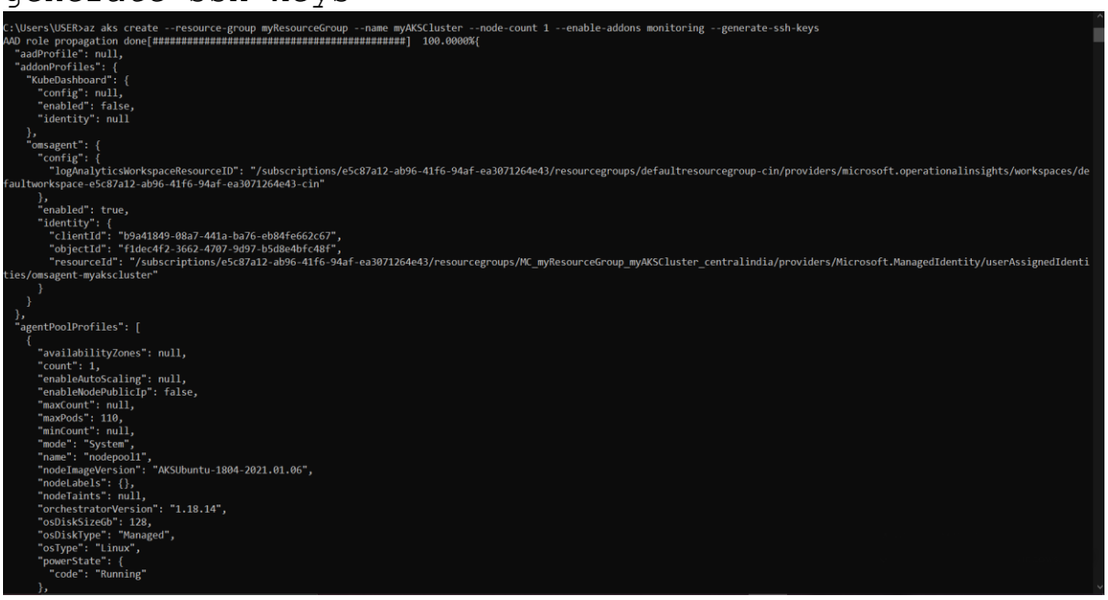
```
az group create --name myResourceGroup --location
centralindia
```

Output similar to the following example indicates the resource group has been created successfully:

Step 6: Use the `az aks create` command to create an AKS cluster. The

following example creates a cluster named *myAKSCluster* with one node. This will take several minutes to complete.

```
az aks create --resource-group myResourceGroup --name myAKSCluster --node-count 1 --enable-addons monitoring --generate-ssh-keys
```



After a few minutes, the command completes and returns JSON-formatted information about the cluster.

Practical no 6

Create an Application Gateway Using Ocelot and Securing APIs with Azure AD

Q6: Create an Application Gateway Using Ocelot and Securing APIs with Azure AD.

API Gateway is an API management tool that usually sits between the external caller (Web or Mobile) and the internal services.

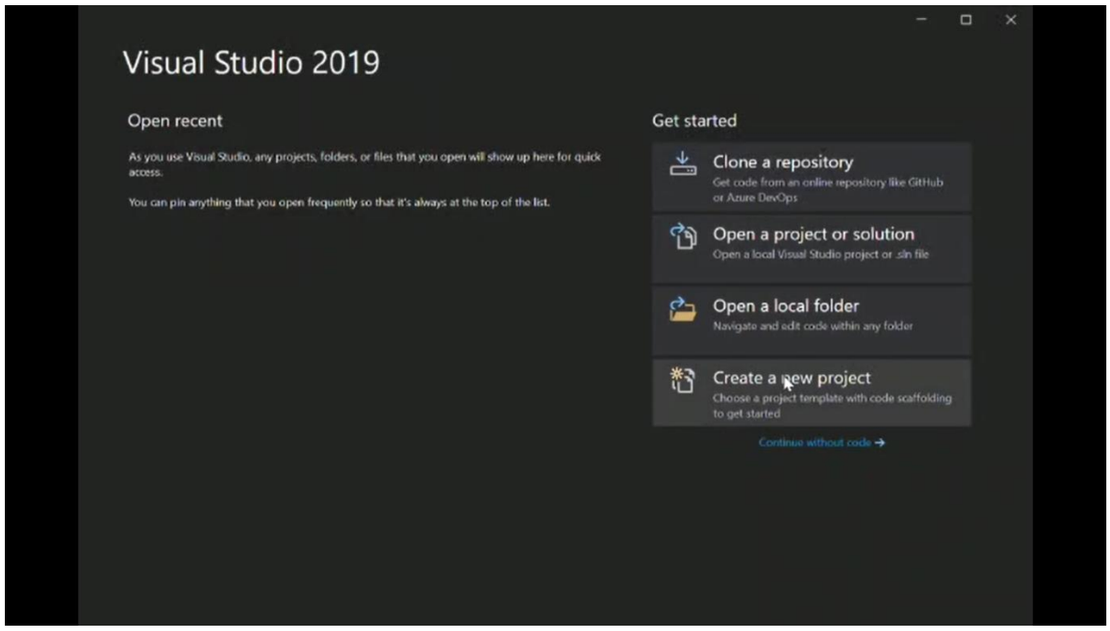
The API Gateway can provide multiple features like:

1. Routing Request
2. Aggregations
3. Authentication
4. Authorization
5. Rate Limiting
6. Caching
7. Load Balancing ETC.

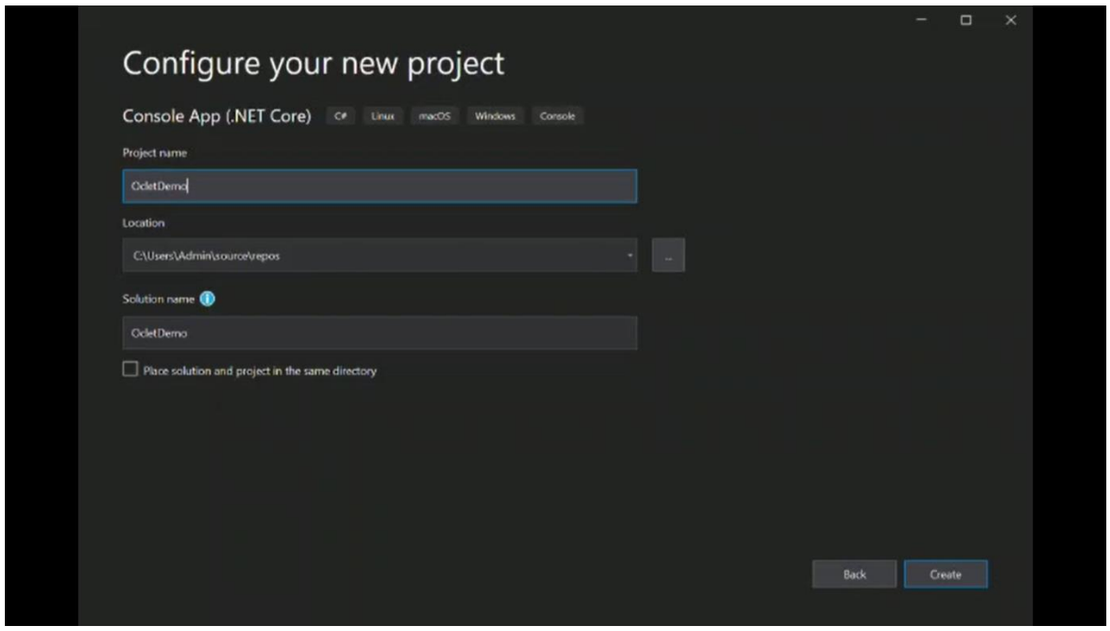
Ocelot is an ASP.Net Core (Supports .Net Core 3.1) API Gateway. It's a NuGet package, which can be added to any ASP.Net Core application to make it an API Gateway. Ocelot API Gateway supports all the features that any standard API Gateway does.

Steps:

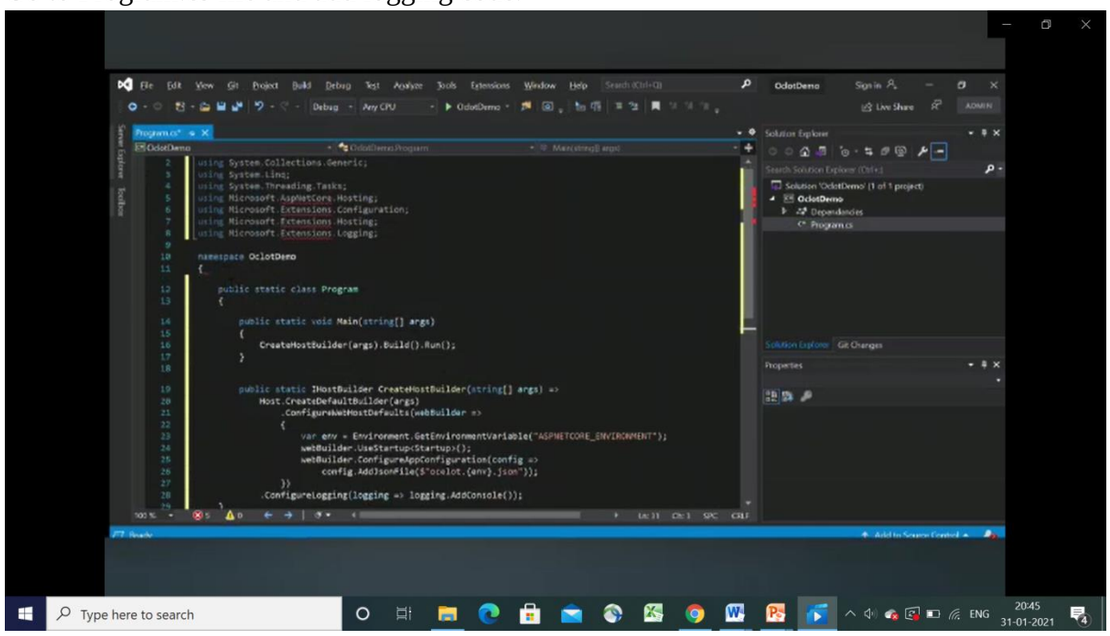
1. Create an ASP.NET Core Web Application Project.



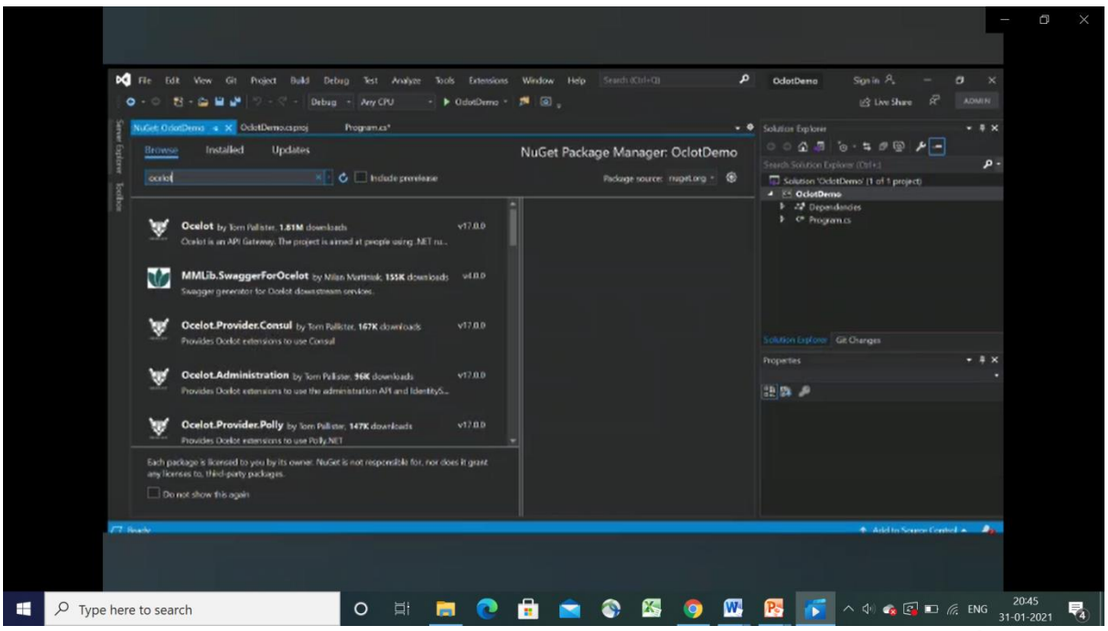
2. Create an empty ASP.NET Core 3.1 and and give a name of the Project.



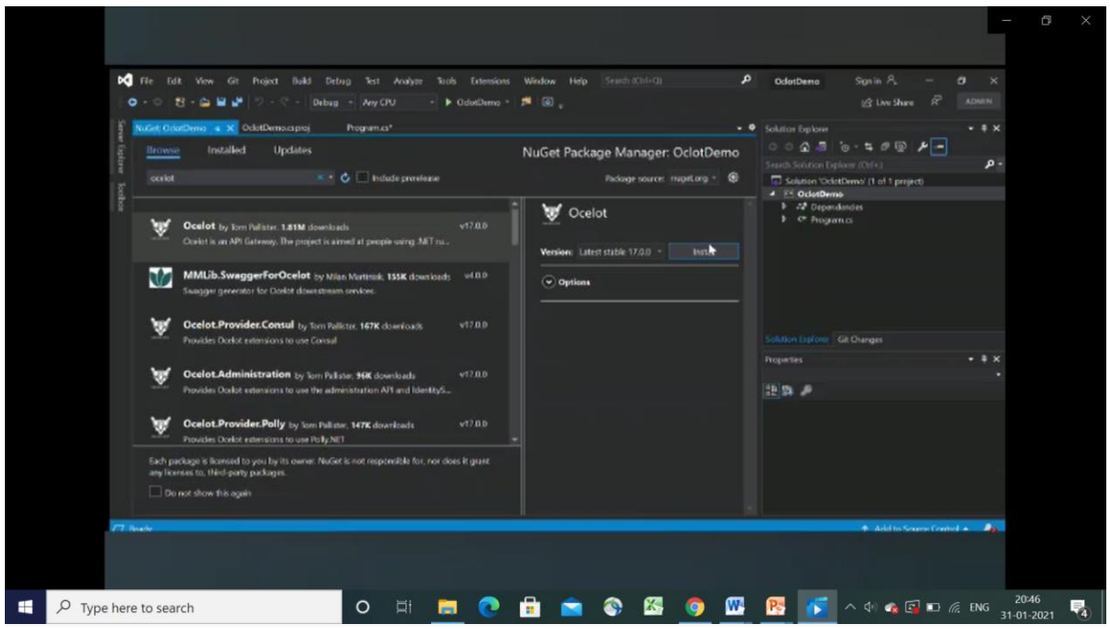
3. Go to Program.cs file and add logging code.



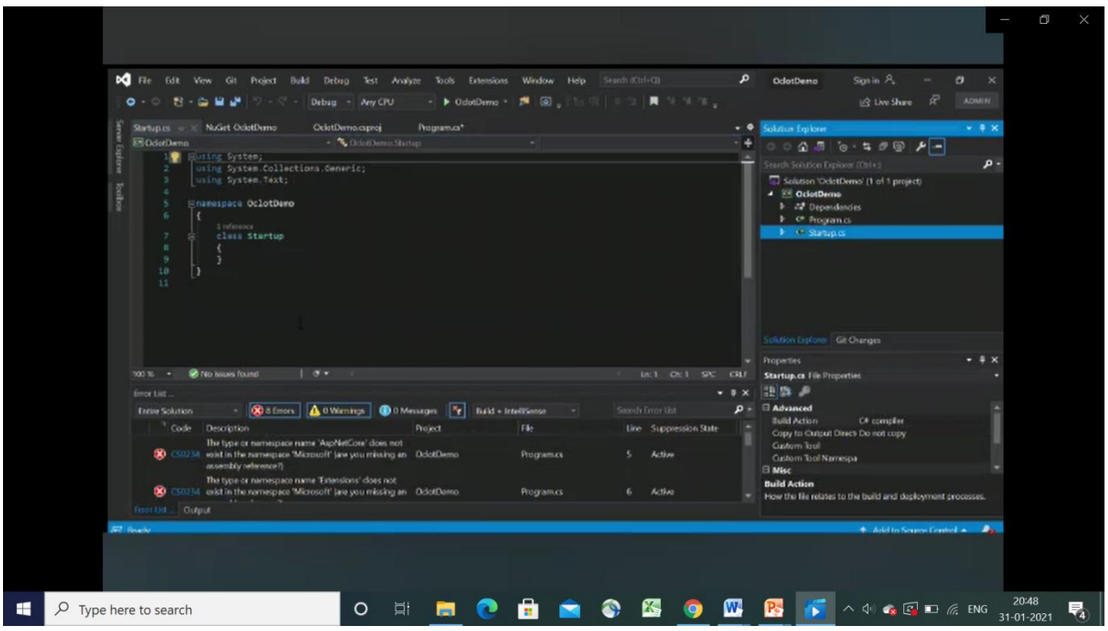
4. Now add new NuGet package for Ocelot



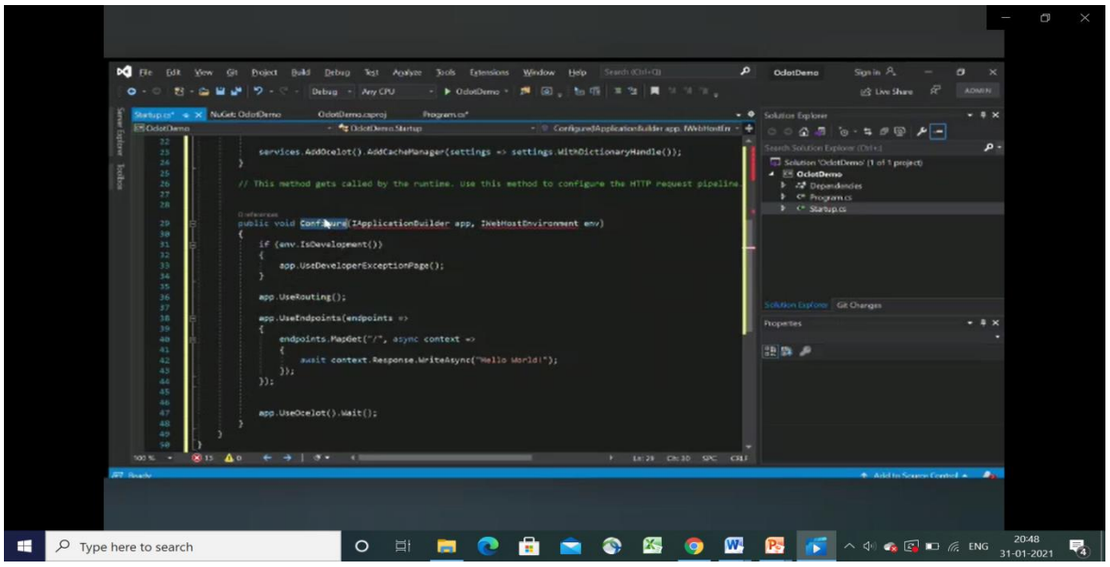
5. Click on Project -> Manage NuGet Package -> Click on Browse -> Search for ocelot package -> install.



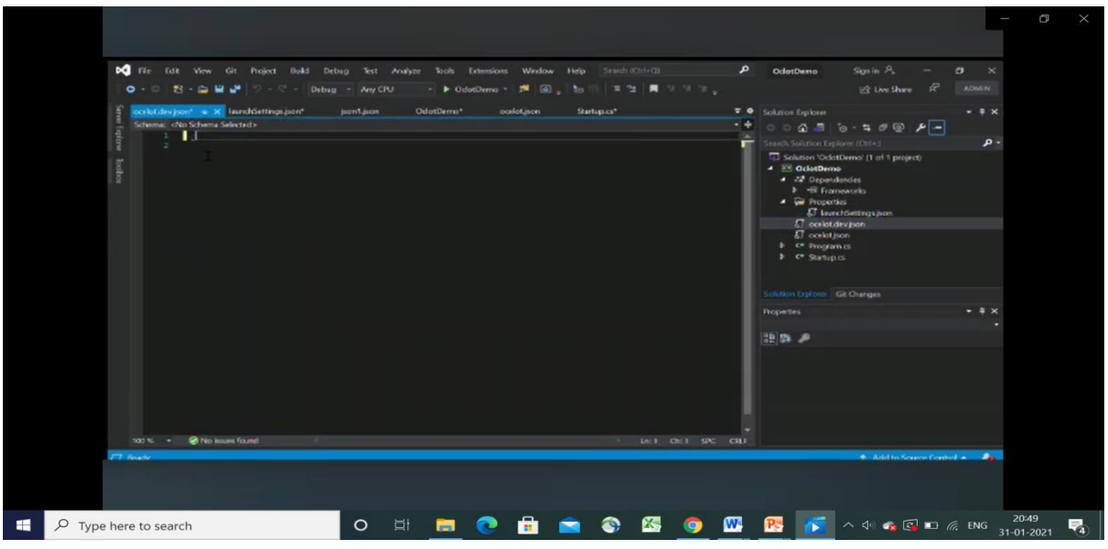
6. Once Ocelot Package is installed Go to Startup.cs



7. Now to Configure Ocelot add services.Addocelot() and app.UseOcelot().Wait() code.

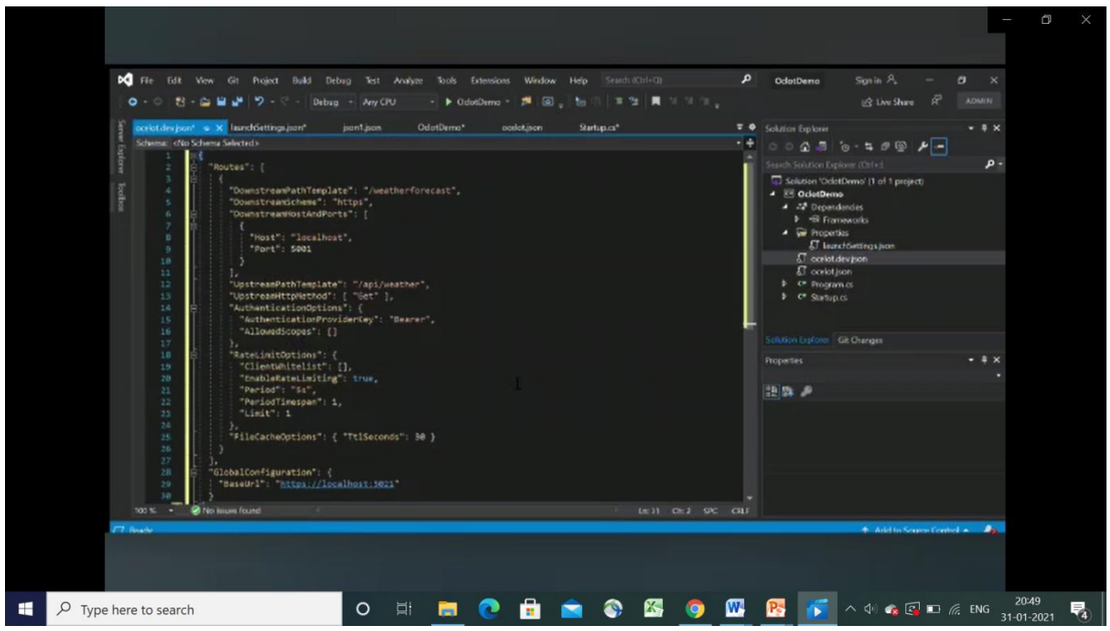


8. Now add the Ocelot JSON file.

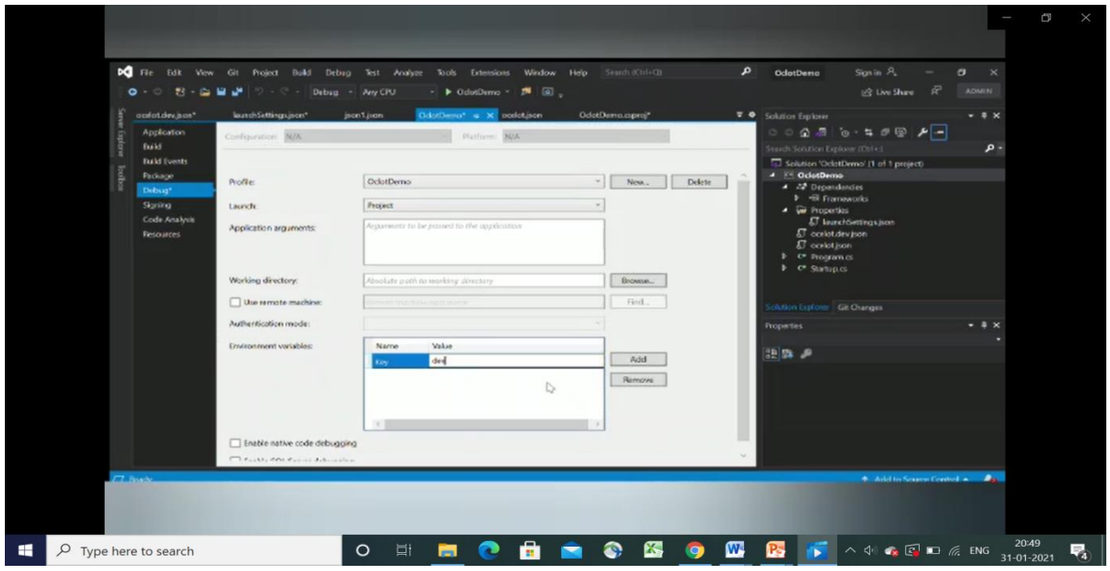


9. Click on Project name -> Add -> New Item -> JSON File ->(Give name)

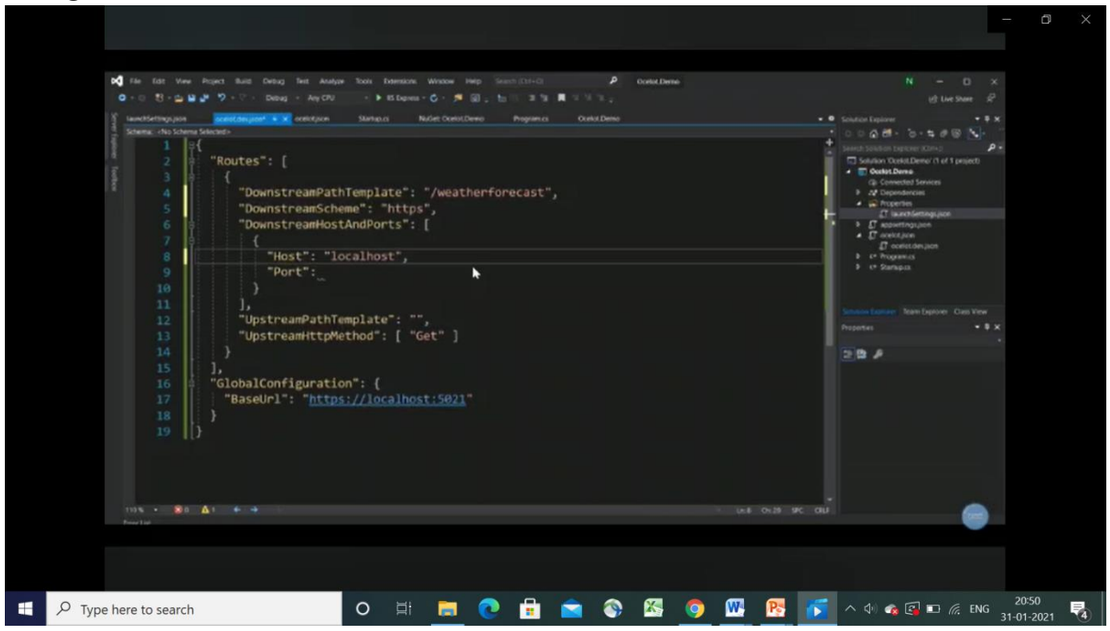
10. Add JSON Code.



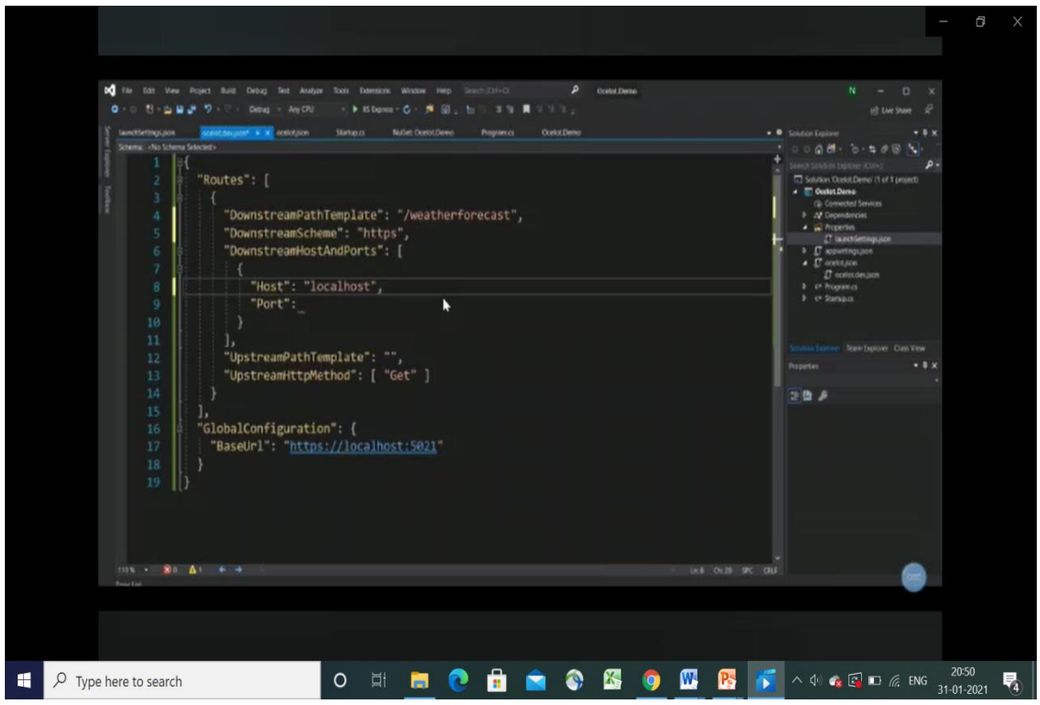
11. Create an Environmental Variable



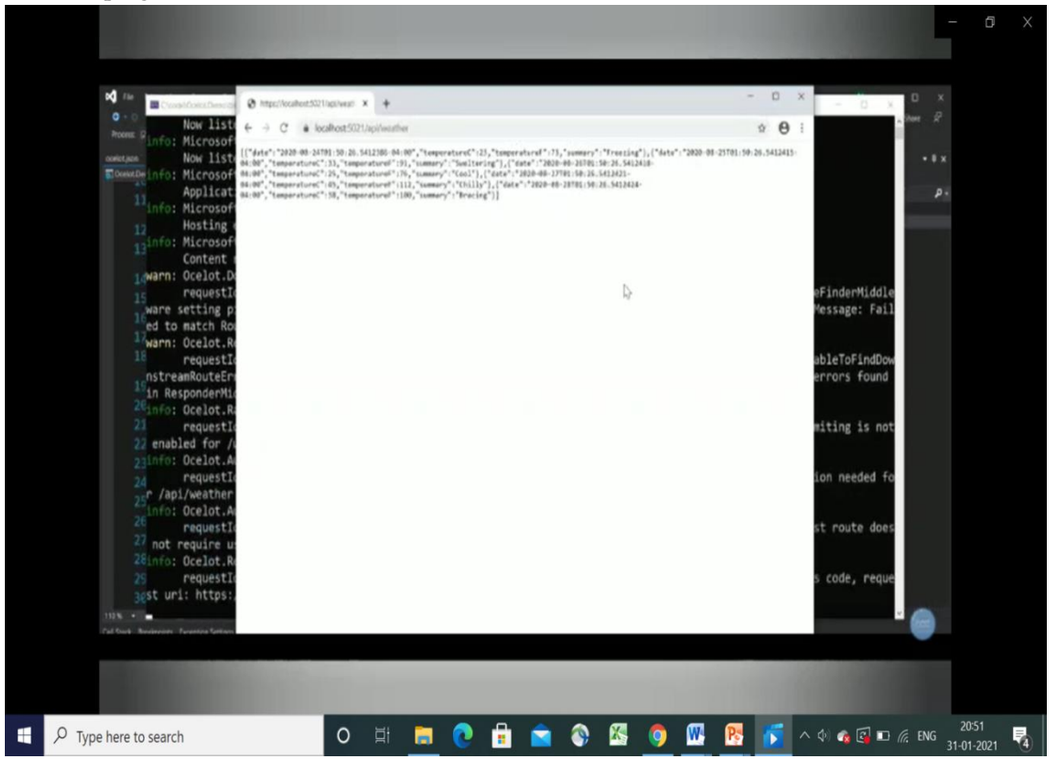
12. Change localhost to 5020 and 5021.



13. Add Configuration to the system.



14. Run the project.



Code:

Program.cs file

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;
using Microsoft.AspNetCore.Hosting;
using Microsoft.Extensions.Configuration;
using Microsoft.Extensions.Hosting;
```

```
using Microsoft.Extensions.Logging;
namespace Oclot.Demo
{
   public static class Program
   {
      public static void Main(string[] args)
      {
         CreateHostBuilder(args).Build().Run();  }
      public static IHostBuilder CreateHostBuilder(string[] args) =>
         Host.CreateDefaultBuilder(args)
            .ConfigureWebHostDefaults(webBuilder =>
            {
               var env =
Environment.GetEnvironmentVariable("ASPNETCORE_ENVIRONMENT");
               webBuilder.UseStartup<Startup>();
               webBuilder.ConfigureAppConfiguration(config =>
config.AddJsonFile($"ocelot.{env}.json"));
            })
         .ConfigureLogging(logging => logging.AddConsole());
   }
}
```

Startup.cs file

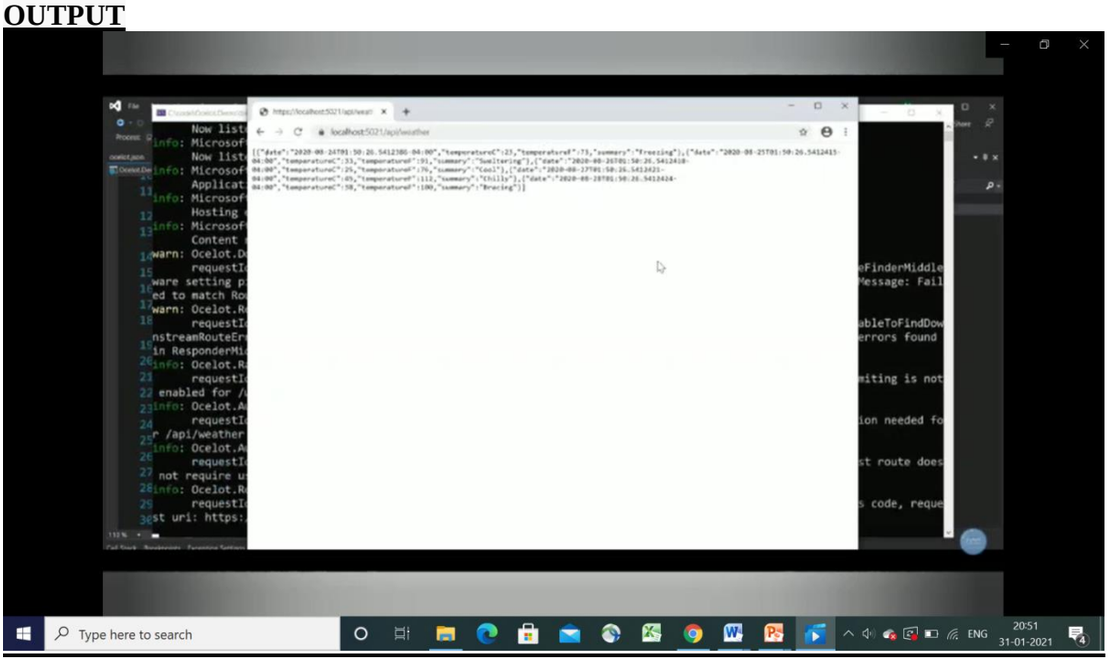
```
namespace Oclot.Demo
{
   public class Startup
   {
      public void ConfigureServices(IServiceCollection services)
      {
         services.AddOcelot().AddCacheManager(settings => settings.WithDictionaryHandle());
      }
      public void Configure(IApplicationBuilder app, IWebHostEnvironment env)
      {
         if (env.IsDevelopment())
         {
            app.UseDeveloperExceptionPage();
         }
         app.UseRouting();
         app.UseEndpoints(endpoints =>
         {
            endpoints.MapGet("/", async context =>
            {
               await context.Response.WriteAsync("Hello World!");
            });
         });
         app.UseOcelot().Wait();
      }
   }
}
```

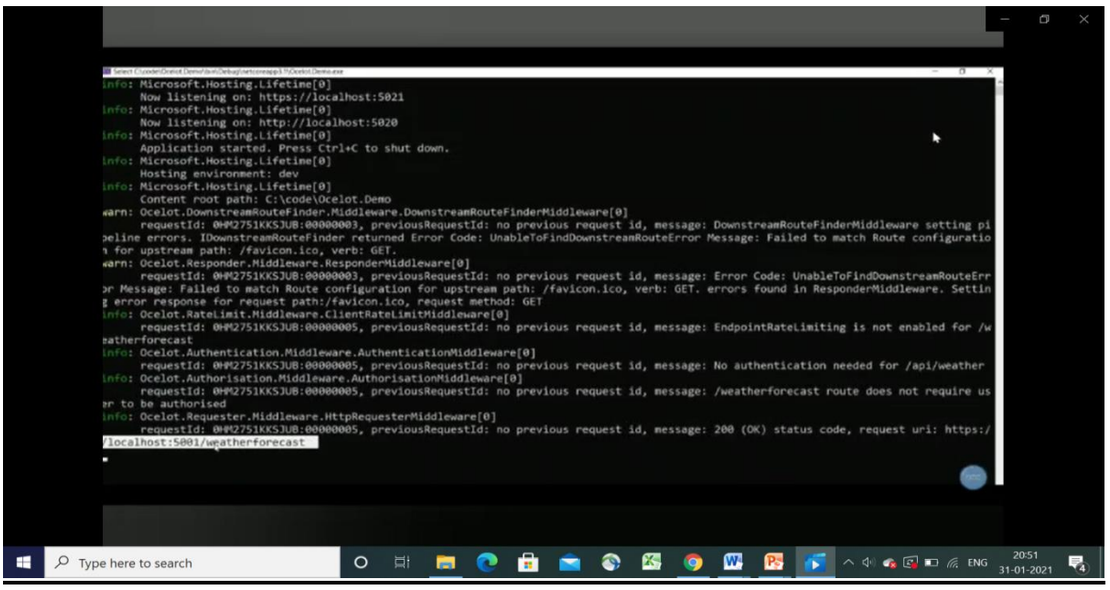
JSON file

```
{
  "Routes": [
    {
      "DownstreamPathTemplate": "/weatherforecast",
      "DownstreamScheme": "https",
      "DownstreamHostAndPorts": [
        {
          "Host": "localhost",
          "Port": 5001
        } ],
      "UpstreamPathTemplate": "/api/weather",
      "UpstreamHttpMethod": [ "Get" ],
      "AuthenticationOptions": {
        "AuthenticationProviderKey": "Bearer",
        "AllowedScopes": []  },
      "RateLimitOptions": {
        "ClientWhitelist": [],
        "EnableRateLimiting": true,
```

```
      "Period": "5s",
      "PeriodTimespan": 1,
      "Limit": 1 },
    "FileCacheOptions": { "TtlSeconds": 30 }
  }],
 "GlobalConfiguration": {
   "BaseUrl": "https://localhost:5021"
 }
}
```

OUTPUT





Practical no 7

Create a database design for Microservices an application using the database.

Choosing a Data Store

There are many risks associated with embracing a 1.0-level technology. The ecosystem is generally immature, so support for your favorite things may be lacking or missing entirely. Tooling and integration and overall developer experience are often high-friction. Despite the long and storied history of

.NET, .NET Core (and especially the associated tooling) should still be treated like a brand new 1.0 product.

One of things we might run into when trying to pick a data store that is compatible with EF Core is a lack of available providers. While this list will likely have grown by the time you read this, at the time this chapter was written, the following providers were available for EF Core:

- SQL Server
- SQLite
- Postgres
- IBM databases
- MySQL
- SQL Server Lite
- In-memory provider for testing
- Oracle

For databases that aren't inherently compatible with the Entity Framework relational model, like MongoDB, Neo4j, Cassandra, etc., you should be able to find client libraries available that will work with .NET Core. Since most of these databases expose simple RESTful APIs, you should still be able to use them even if you have to write your own client.

Because of my desire to keep everything as cross-platform as possible throughout this book, I decided to use Postgres instead of SQL Server to accommodate readers working on Linux or Mac workstations. Postgres is also easily installed on Windows.

Building a Postgres Repository

In order to get something running and focus solely on the discipline and code required to stand up a simple service, we used an in-memory repository that didn't amount to much more than a fake that aided us in writing tests.

In this section we're going upgrade our location service to work with Postgres. To do this we're going to create a new repository implementation that encapsulates the PostgreSQL client communication. Before we get to the implementation code, let's revisit the interface for our location repository.

Example 1. ILocationRecordRepository.cs

```
using System;
using System.Collections.Generic;

namespace StatlerWaldorfCorp.LocationService.Models { public

    interface ILocationRecordRepository {
        LocationRecord Add(LocationRecord locationRecord); LocationRecord
        Update(LocationRecord locationRecord); LocationRecord Get(Guid
        memberId, Guid recordId); LocationRecord Delete(Guid memberId, Guid
        recordId);

        LocationRecord GetLatestForMember(Guid memberId);

        ICollection<LocationRecord> AllForMember(Guid memberId);
    }
}
```

The location repository exposes standard CRUD functions like Add, Update, Get, and Delete. In addition, this repository exposes methods to obtain the latest location entry for a member as well as the entire location history for a member.

The purpose of the location service is solely to track location data, so you'll notice that there is no reference to team membership at all in this interface.

Creating a Database Context

The next thing we're going to do is create a database context. This class will serve as a wrapper around the base DbContext class we get from Entity Framework Core. Since we're dealing with locations, we'll call our context class LocationDbContext.

If you're not familiar with Entity Framework or EF Core, the database context acts as the gateway between your database-agnostic model class (POCOs, or Plain-Old C# Objects) and the real database. For more information on EF Core, check out Microsoft's documentation. We could probably spend another several chapters doing nothing but exploring its details, but since we're trying to stay focused on cloud-native applications and services, we'll use just enough EF Core to build our services.

The pattern for using a database context is to create a class that inherits from it that is specific to your model. In our case, since we're dealing with locations, we'll create a LocationDbContext class.

Example 2. LocationDbContext.cs

```
using Microsoft.EntityFrameworkCore;
using StatlerWaldorfCorp.LocationService.Models; using
Npgsql.EntityFrameworkCore.PostgreSQL;

namespace StatlerWaldorfCorp.LocationService.Persistence
{
    public class LocationDbContext : DbContext
    {
        public LocationDbContext(
            DbContextOptions<LocationDbContext> options) :
                base(options)
        {
        }

        protected override void OnModelCreating(
            ModelBuilder modelBuilder)
        {
            base.OnModelCreating(modelBuilder);
            modelBuilder.HasPostgresExtension("uuid-ossp");
        }

        public DbSet<LocationRecord> LocationRecords {get; set;}
    }
}
```

Here we can use the ModelBuilder and DbContextOptions classes to perform any additional setup we need on the context. In our case, we're ensuring that our model has the uuid-osspPostgres extension to support the member ID field.

Implementing the Location Record Repository Interface

Now that we have a context through which other classes can use to communicate with the database, we can create a real implementation of the ILocationRecordRepositoryinterface. This real implementation will take an instance of LocationDbContext as a constructor parameter. This sets us up nicely to configure this context with environment-supplied connection strings when deploying for real and with mocks or in-memory providers when testing.

Example 3 contains the code for the LocationRecordRepositoryclass

Example 3. LocationRecordRepository.cs

```
using System; using
System.Linq;
using System.Collections.Generic;
using StatlerWaldorfCorp.LocationService.Models;

namespace StatlerWaldorfCorp.LocationService.Persistence
{
   public class LocationRecordRepository :
      ILocationRecordRepository
   {
         private LocationDbContext context;

         public LocationRecordRepository(LocationDbContext context)
         {
               this.context = context;
         }

         public LocationRecord Add(LocationRecord locationRecord)
         {
               this.context.Add(locationRecord);
               this.context.SaveChanges(); return
               locationRecord;
         }

         public LocationRecord Update(LocationRecord locationRecord)
         {
               this.context.Entry(locationRecord).State =
                     EntityState.Modified;
               this.context.SaveChanges(); return
               locationRecord;
         }

         public LocationRecord Get(Guid memberId, Guid recordId)
         {
               return this.context.LocationRecords
                 .Single(lr => lr.MemberID == memberId &&
                                    lr.ID == recordId);
         }

         public LocationRecord Delete(Guid memberId, Guid  recordId)
         {
               LocationRecord locationRecord =
                  this.Get(memberId, recordId);
               this.context.Remove(locationRecord);
               this.context.SaveChanges();
               return locationRecord;
```

```
        }

        public LocationRecord GetLatestForMember(Guid memberId)
        {
            LocationRecord locationRecord =
               this.context.LocationRecords.
                  Where(lr => lr.MemberID == memberId).
                  OrderBy(lr => lr.Timestamp).
                  Last();
            return locationRecord;
        }

        public ICollection<LocationRecord> AllForMember(Guid  memberId)
        {
            return this.context.LocationRecords.
                  Where(lr => lr.MemberID == memberId).
                  OrderBy(lr => lr.Timestamp).
                  ToList();
        }
    }
}
```

The code here is pretty straightforward. Any time we make a change to the database, we call SaveChangeson the context. If we need to query, we use the LINQ expression syntax where we can combine Whereand OrderByto filter and sort the results.

When we do an update, we need to flag the entity we're updating as a modified entry so that Entity Framework Core knows how to generate an appropriate SQL UPDATEstatement for that record. If we don't modify this entry state, EF Core won't know anything has changed and so a call to SaveChangeswill do nothing.

The next big trick in this repository is injecting the Postgres-specific database context. To make this happen, we need to add this repository to the dependency injection system in the ConfigureServices method of our Startupclass.

Example 4. ConfigureServices method in Startup.cs

```
public void ConfigureServices(IServiceCollection services)
{
        services.AddEntityFrameworkNpgsql()
            .AddDbContext<LocationDbContext>(options =>
                    options.UseNpgsql(Configuration));
        services.AddScoped<ILocationRecordRepository, LocationRecordRepository>();
        services.AddMvc();
}
```

First we want to use the AddEntityFrameworkNpgsql extension method exposed by the Postgres EF Core provider. Next, we add our location repository as a scoped service. When we use the AddScopedmethod, we're indicating that every new request made to our service gets a newly create instance of this repository.

Configuring a Postgres Database Context

The repository we built earlier requires some kind of database context in order to function. The database context is the core primitive of Entity Framework Core. To create a database context for the location model, we just need to create a class that inherits from DbContext. I've also included a DbContextFactory because that can sometimes make running the Entity Framework Core command-line tools simpler:

```
using Microsoft.EntityFrameworkCore;
using Microsoft.EntityFrameworkCore.Infrastructure; using
StatlerWaldorfCorp.LocationService.Models; using
Npgsql.EntityFrameworkCore.PostgreSQL;

namespace StatlerWaldorfCorp.LocationService.Persistence
{
    public class LocationDbContext : DbContext
    {
        public LocationDbContext(
          DbContextOptions<LocationDbContext> options)  :base(options)
        {
        }

        protected override void OnModelCreating(
            ModelBuilder modelBuilder)
        {
            base.OnModelCreating(modelBuilder);
            modelBuilder.HasPostgresExtension("uuid-ossp");
        }

        public DbSet<LocationRecord> LocationRecords {get; set;}
    }


        public class LocationDbContextFactory :
      IDbContextFactory<LocationDbContext>
    {
        public LocationDbContext
          Create(DbContextFactoryOptions  options)
        {
            var optionsBuilder =
              new DbContextOptionsBuilder<LocationDbContext>(); var
            connectionString =
              Startup.Configuration
                .GetSection("postgres:cstr").Value;
```

```
                optionsBuilder.UseNpgsql(connectionString);

                return new LocationDbContext(optionsBuilder.Options);
            }
        }
    }
```

With a new database context, we need to make it available for dependency injection so that the location repository can utilize it:

```
    public void ConfigureServices(IServiceCollection services)
    {
        var transient = true;
        if (Configuration.GetSection("transient") != null) { transient =
            Boolean.Parse(Configuration
              .GetSection("transient").Value);
        }
        if (transient) { logger.LogInformation(
              "Using transient location record repository.");
            services.AddScoped<ILocationRecordRepository,
                                InMemoryLocationRecordRepository>();
        } else {
            var connectionString = Configuration.GetSection("postgres:cstr").Value;

            services.AddEntityFrameworkNpgsql()
                    .AddDbContext<LocationDbContext>(options =>
                                options.UseNpgsql(connectionString));
            logger.LogInformation(
              "Using '{0}' for DB connection string.",
              connectionString);
            services.AddScoped<ILocationRecordRepository,
              LocationRecordRepository>();
        }

        services.AddMvc();
    }
```

The calls to AddEntityFrameworkNpgsql and AddDbContext are the magic that makes everything happen here.

With a context configured for DI, our service should be ready to run, test, and accept EF Core command-line parameters like the ones we need to execute migrations. When building your own database-backed services, you can also use the EF Core command-line tools to reverse-engineer migrations from existing database schemas.

Exercising the Data Service

Running the data service should be relatively easy. The first thing we're going to need to do is spin up a running instance of Postgres. If you were paying attention to the wercker.yml file for the location service that sets up the integration tests, then you might be able to guess at the docker run command to start Postgres with our preferred parameters:

```
$ docker run -p 5432:5432 --name some-postgres \
  -e POSTGRES_PASSWORD=inteword -e POSTGRES_USER=integrator \
  -e POSTGRES_DB=locationservice -d postgres
```

This starts the Postgres Docker image with the name some-postgres (this will be important shortly). To verify that we can connect to Postgres, we can run the following Docker command to launch psql:

```
$ docker run -it --rm --link some-postgres:postgres postgres \
  psql -h postgres -U integrator -d locationservice
```

With the database up and running, we need a schema. The tables in which we expect to store the migration metadata and our location records don't yet exist. To put them in the database, we just need to run an EF Core command from the location service's project directory. Note that we're also setting environment variables that we'll need soon:

```
$ export TRANSIENT=false
$ export POSTGRES__CSTR="Host=localhost;Username=integrator; \
  Password=inteword;Database=locationservice;Port=5432"
$ dotnet ef database update
```

At this point Postgres is running with a valid schema and it's ready to start accepting commands from the location service. Here's where it gets a little tricky. If we're going to run the location service from inside a Docker image, then referring to the Postgres server's host as localhost won't work —because that's the host inside the Docker image. What we need is for the location service to reach out of its container and then into the Postgres container. We can do this with a container link that creates a virtual hostname (we'll call it postgres), but we'll need to change our environment variable before launching the Docker image:

```
$ export POSTGRES__CSTR="Host=postgres;Username=integrator; \
Password=inteword;Database=locationservice;Port=5432"
$ docker run -p 5000:5000 --link some-postgres:postgres \
  -e TRANSIENT=false -e PORT=5000 \
  -e POSTGRES__CSTR dotnetcoreservices/locationservice:latest
```

Now that we've linked the service's container to the Postgres container via the postgres hostname, the location service should have no trouble connecting to the database. To see this all in action, let's submit a location record (as usual, take the line feeds out of this command when you type it):

```
$ curl -H "Content-Type:application/json" -X POST -d \
  '{"id":"64c3e69f-1580-4b2f-a9ff-2c5f3b8f0e1f","latitude":12.0, \
    "longitude":10.0,"altitude":5.0,"timestamp":0, \
    "memberId":"63e7acf8-8fae-42ce-9349-3c8593ac8292"}' \
  http://localhost:5000/locations/63e7acf8-8fae-42ce-9349-3c8593ac8292
```

Take a look at the trace output from your running Docker image for the location service. You should see some very useful Entity Framework trace data explaining what happened. The service performed a SQL INSERT, so things are looking promising:

```
info: Microsoft.EntityFrameworkCore.Storage.

 IRelationalCommandBuilderFactory[1]
       Executed DbCommand (23ms)
 [Parameters=[@p0='?', @p1='?', @p2='?', @p3='?', @p4='?', @p5='?'],
  CommandType='Text', CommandTimeout='30']
       INSERT INTO "LocationRecords" ("ID", "Altitude", "Latitude",
 "Longitude", "MemberID", "Timestamp")
       VALUES (@p0, @p1, @p2, @p3, @p4, @p5);
 info: Microsoft.AspNetCore.Mvc.Internal.ObjectResultExecutor[1]
       Executing ObjectResult, writing value Microsoft.AspNetCore
 .Mvc.ControllerContext.
 info: Microsoft.AspNetCore.Mvc.Internal.ControllerActionInvoker[2]
       Executed action StatlerWaldorfCorp.LocationService.
 Controllers.LocationRecordController.AddLocation
 (StatlerWaldorfCorp.LocationService) in 2253.7616ms
 info: Microsoft.AspNetCore.Hosting.Internal.WebHost[2]
       Request finished in 2602.7855ms 201 application/json;
 charset=utf-8
```

Let's ask the service for this fictitious member's location history:

```
$ curl http://localhost:5000/locations/63e7acf8-8fae-42ce-9349-
3c8593ac8292

[{"id":"64c3e69f-1580-4b2f-a9ff-2c5f3b8f0e1f",
  "latitude":12.0,"longitude":10.0,"altitude":5.0,
  "timestamp":0,"memberID":"63e7acf8-8fae-42ce-9349-3c8593ac8292"}]
```

The corresponding Entity Framework trace looks like this:

```
info: Microsoft.EntityFrameworkCore.Storage.
IRelationalCommandBuilderFactory[1]
      Executed DbCommand (23ms) [Parameters=[@__memberId_0='?'],
 CommandType='Text', CommandTimeout='30']
      SELECT "lr"."ID", "lr"."Altitude", "lr"."Latitude",
 "lr"."Longitude", "lr"."MemberID", "lr"."Timestamp"
      FROM "LocationRecords" AS "lr"
      WHERE "lr"."MemberID" = @__memberId_0
      ORDER BY "lr"."Timestamp"
```

Just to be double sure, let's query the latest endpoint to make sure we still get what we expect to see:

```
$ curl http://localhost:5000/locations/63e7acf8-8fae-42ce-9349-
3c8593ac8292 \
/latest

{"id":"64c3e69f-1580-4b2f-a9ff-2c5f3b8f0e1f",
  "latitude":12.0,"longitude":10.0,"altitude":5.0,
  "timestamp":0,"memberID":"63e7acf8-8fae-42ce-9349-3c8593ac8292"}
```

Finally, to prove that we really are using real database persistence and that this isn't just a random fluke, use docker ps and docker kill to locate the Docker process for the location service and kill it. Restart it using the exact same command you used before. You should now be able to query the location service and get the exact same data you had before. Of course, once you stop the Postgres container you'll permanently lose that data.

PRACTICAL 8

Create an API gateway service

a) Create an API Management Service.
Steps for creating an API management service are mentioned below-

Step 1- Sign-in to your **Azure Subscription Portal**
Step 2- Search for "**API Management**", then select API Management in order to create a service instance.
Step 3- As shown in Image 1 Select "**API Management service**"

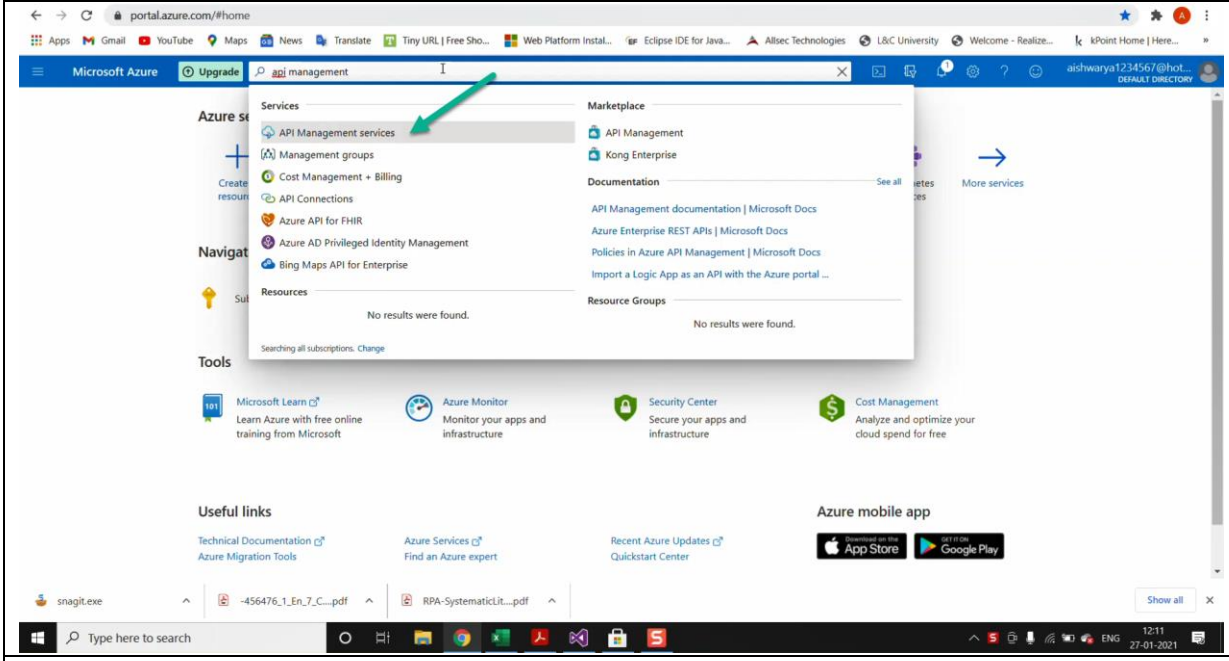


Image 1

Step 4- As API management service page is loaded, select "**Create API management service**" button. As shown in the image 2.

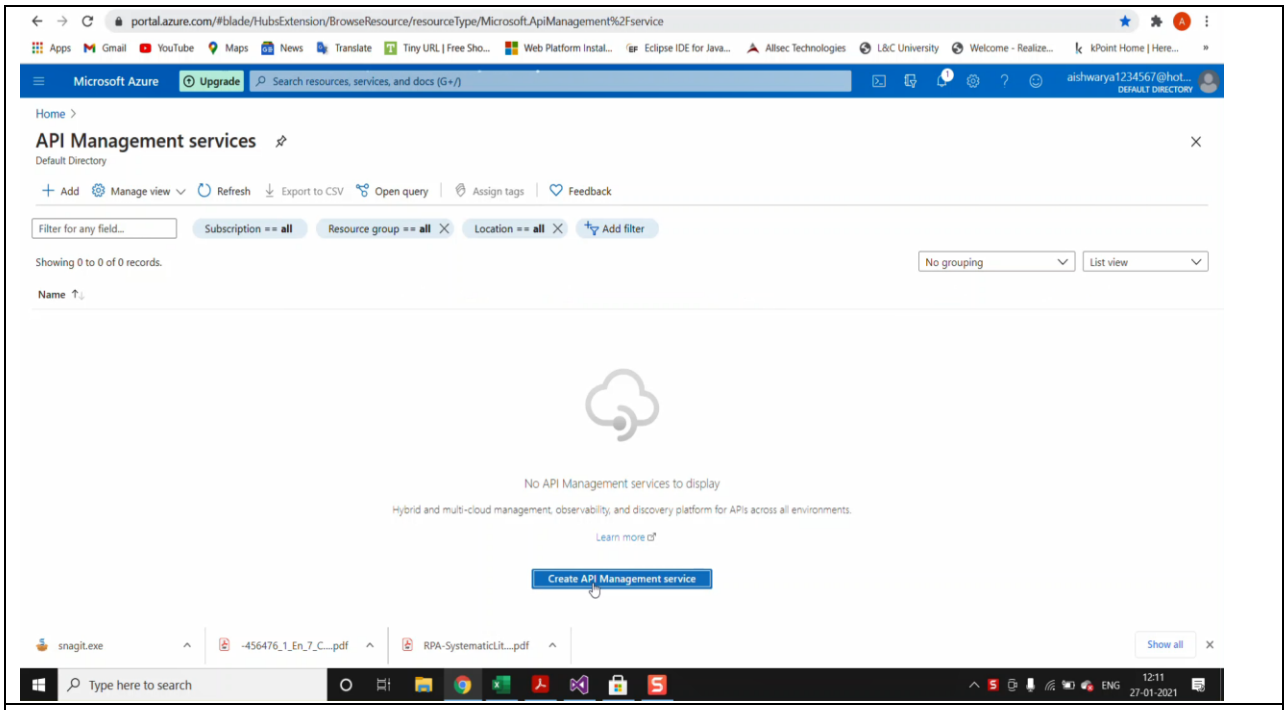


Image 2

Step 5- We will be able to see the **Azure API Management service creation blade** as shown in Image after clicking on the "Create API management service" button

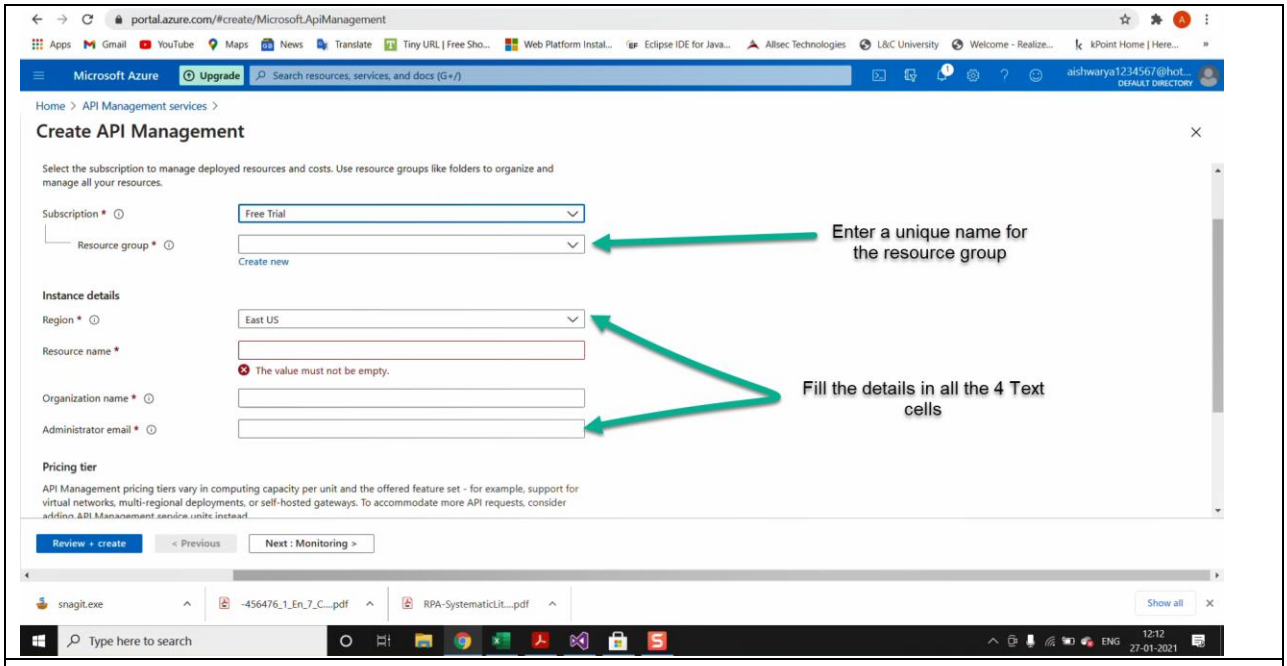


Image 3

Step 6- Provide a **name**. This name sets the URL of the API gateway and portal [**Name- AzureManagementService**]

Step 7-Select the subscription and **resource group** (or create a new resource

group), and select the location. [**Resource Name-AzureManagementService, Location- SouthEast Asia]**
Step 8-Specify the **organization name**. This name will appear in the developer portal as the organization that publishes the API. [**Name-CloudApplicationPratical**]
Step 9- Specify the **email address** of the administrator. The user who creates the service instance will be the default administrator, so it's best to provide the email address of this user until you want someone else to serve as administrator. **[Email ID- aishwarya1234567@hotmail.com]**
Step 10 -Select the pricing tier. The **Developer tier** is the most comprehensive offering, with sufficient request/response limitations in dev/test scenarios.
Step 11-After Completing the form click on **review + create** button to create "Azure API Management service instance". As shown in image 4

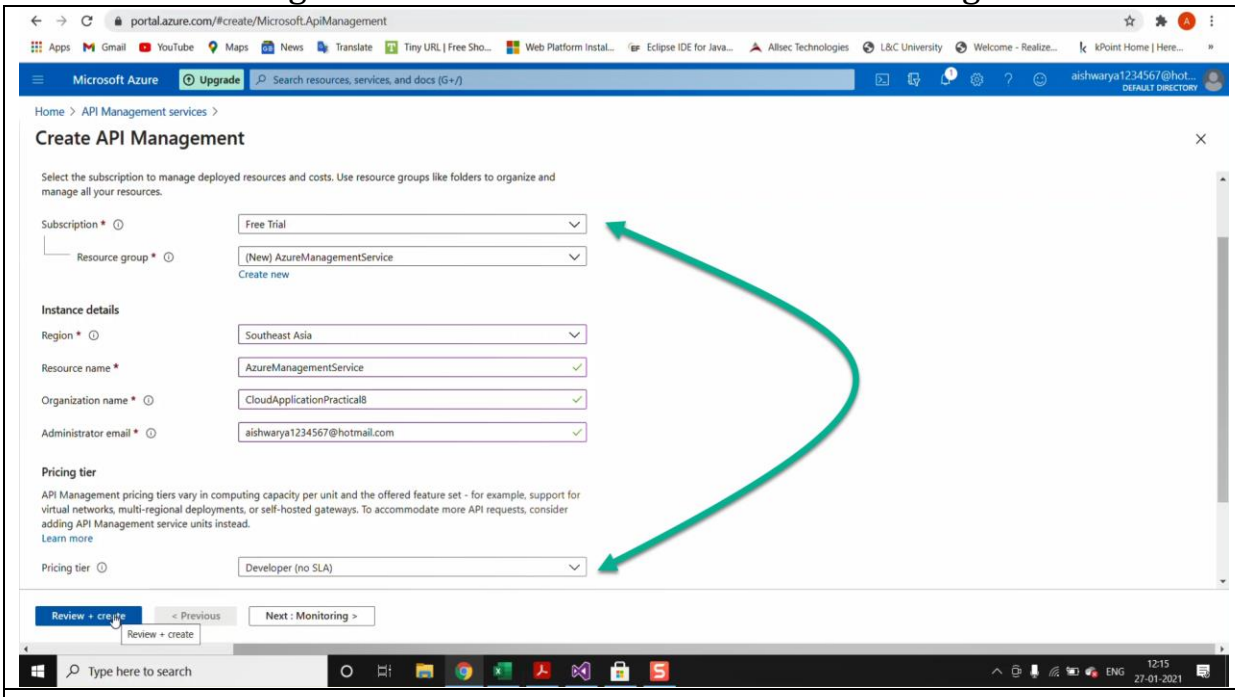


Image 4

Step 12-As shown in the image 5 the status is "**Running Final Validation**". Wait for it to be in "**Validation Passed**" Stage.

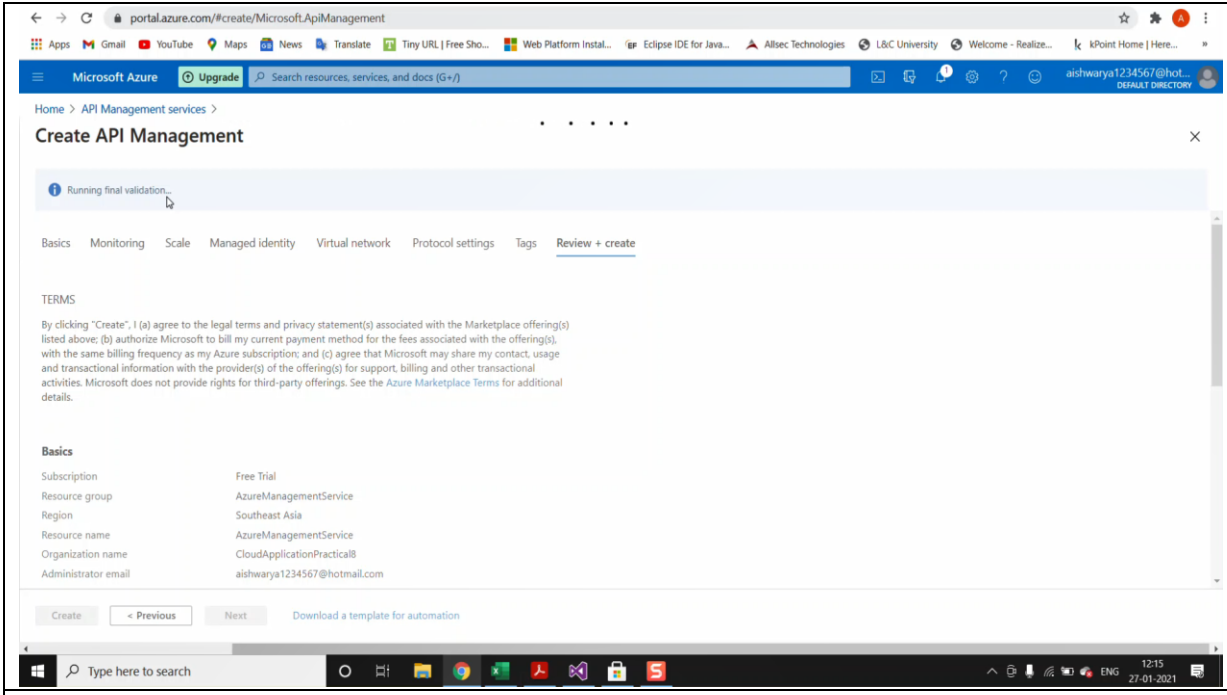


Image 5

Step 13-Once the Validation is done and the label displays “Validation Passed”, Click on **create** button to create the **instance of the service**.

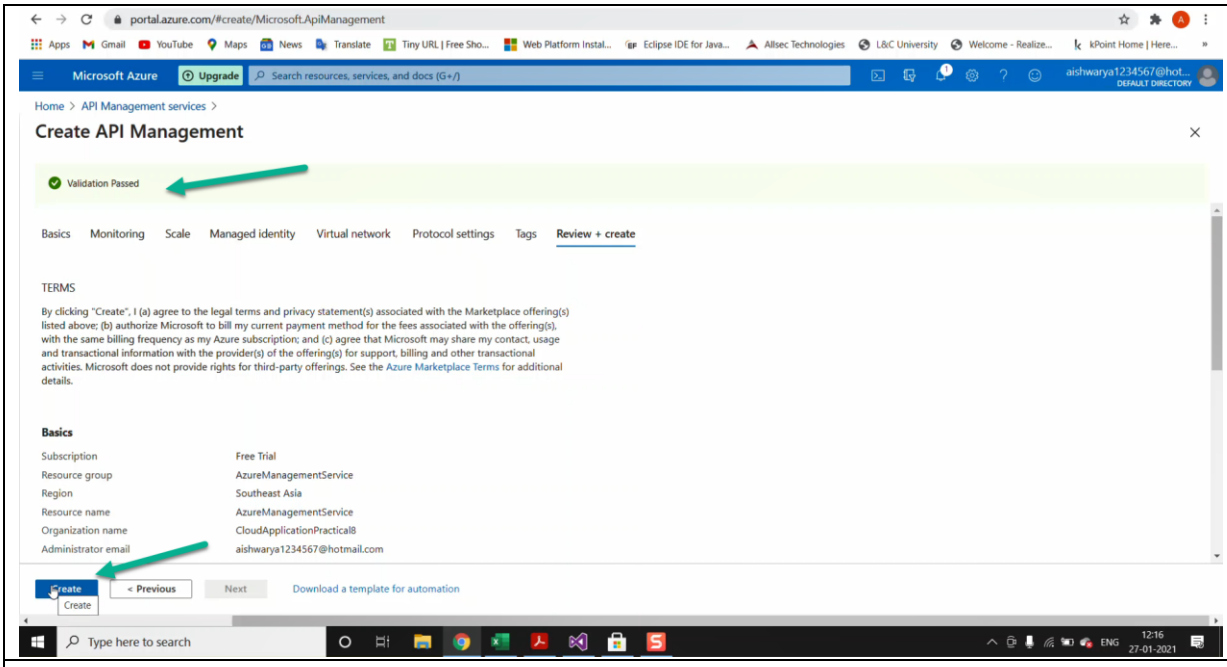


Image 6

Step 14- After clicking on the create button the API management service instance will go to deployment stage as shown in image 7. After the

deployment is complete the instance will be shown as in image 8

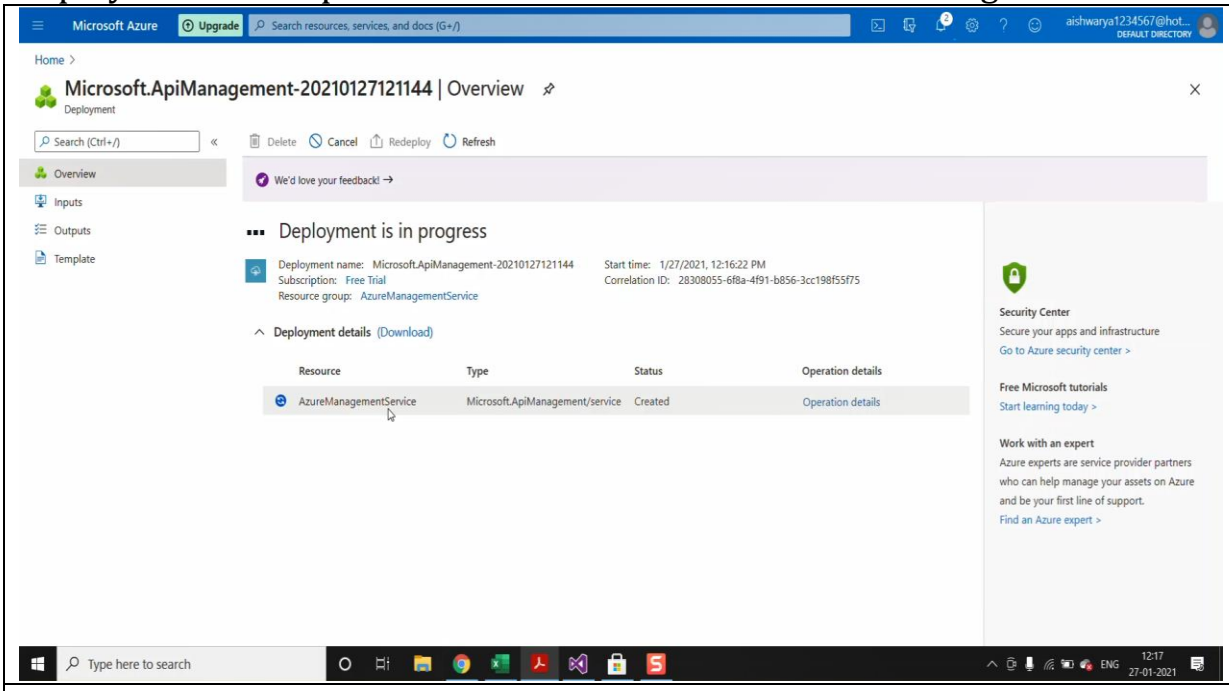


Image 7

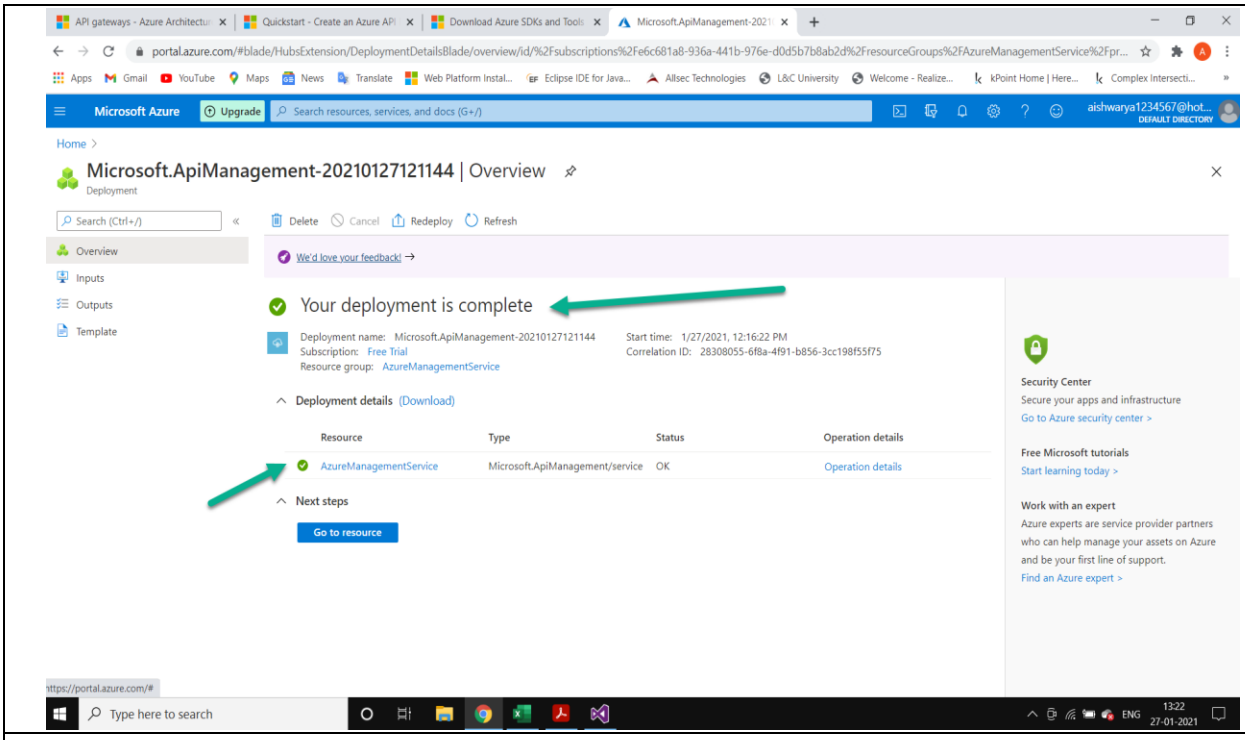


Image 8

Next step is Import an API into API Management and test the API in the Azure portal

Step 15- In the Azure portal, search for and select API Management services.
Step 16- On the API Management services page, select your API Management instance as in image 9.

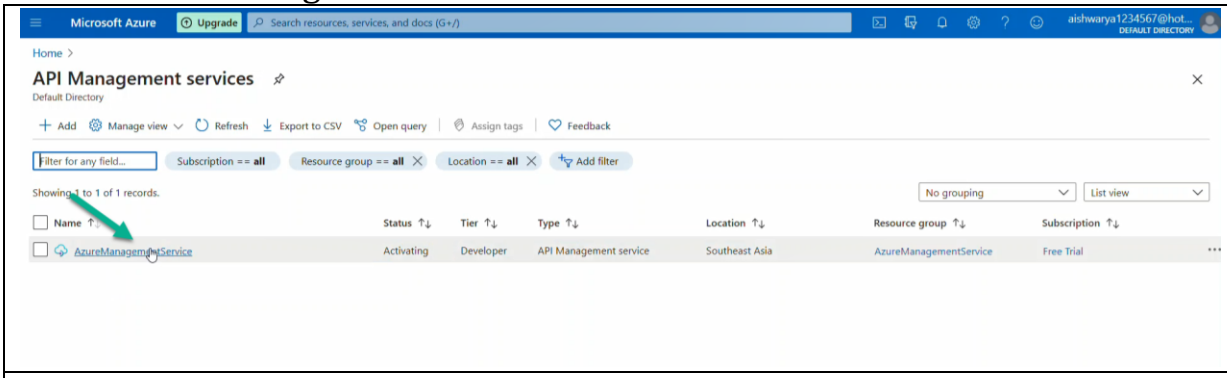


Image 9

Step 17- In the left navigation of **API Management instance**, select APIs.
Step 18- Select the **OpenAPI** tile as shown in image 10.

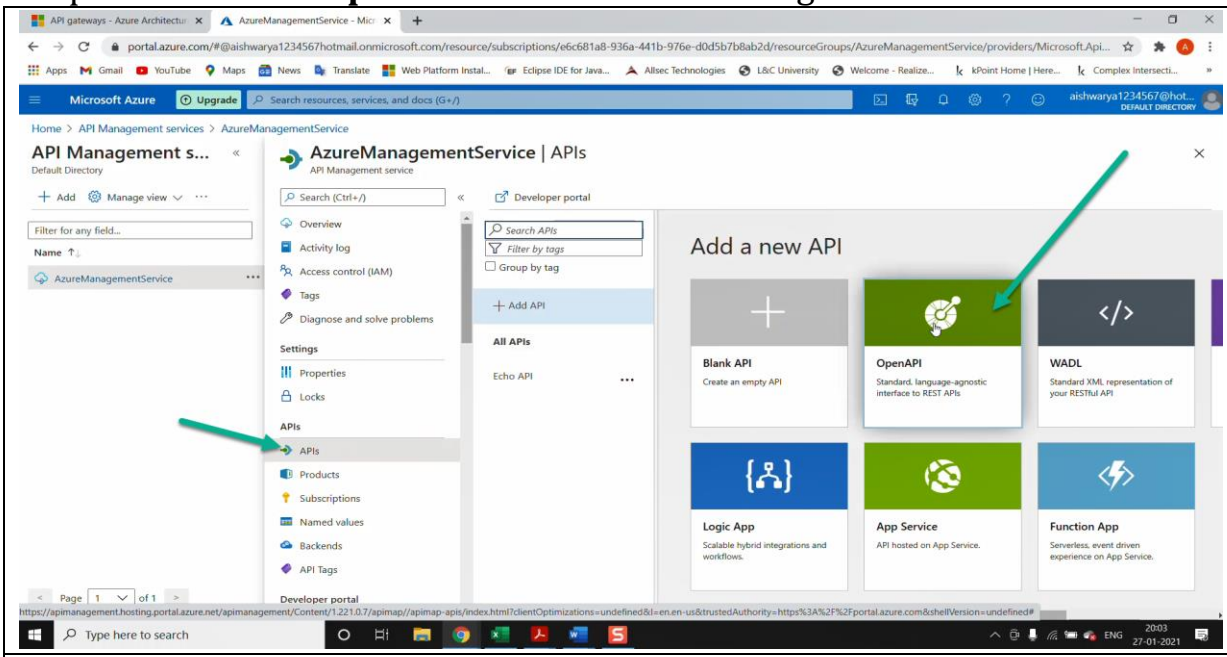


Image 10

Step 19- In the Create from **OpenAPI** specification window, select Full.
Step 20- Enter the values as mentioned below in the form shown in image 11

Setting	Value
OpenAPI specification	https://conferenceapi.azurewebsites.net?format=json
Display name	After you enter the preceding service URL, API Management fills out this field based on the JSON. .(automatic)

Name	After you enter the preceding service URL, API Management fills out this field based on the JSON. .(automatic)
Description	After you enter the preceding service URL, API Management fills out this field based on the JSON.(automatic)
URL scheme	HTTPS
API URL suffix	conference
Tags	-leave it as blank
Products	Unlimited
Gateways	Managed

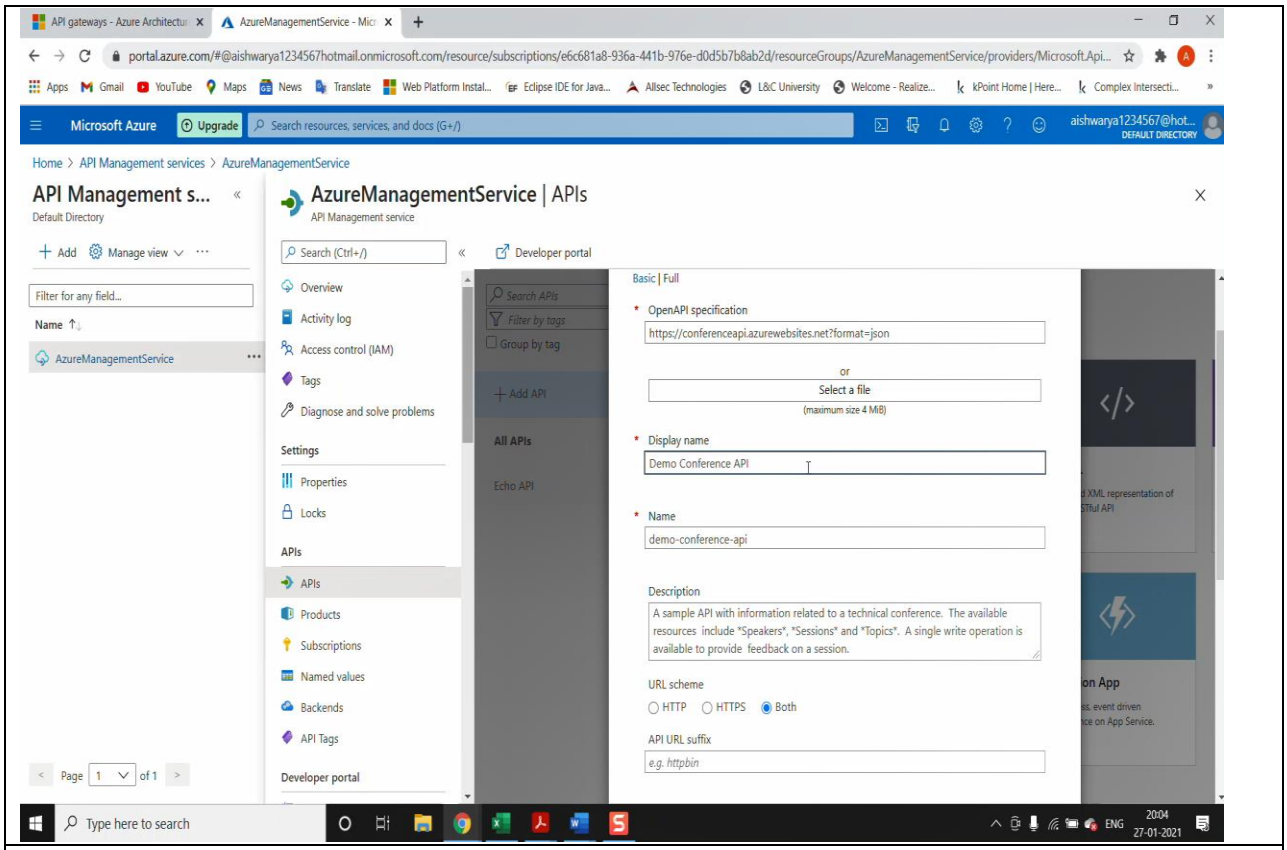


Image 11

Next steps are to Test the new API in the Azure portal

Step 21- In the left navigation of your API Management instance, select APIs > **Demo Conference API.**

Step 22- Select the Test tab, and then select **GetSpeakers**. The page shows Query parameters and Headers, if any. The Ocp-Apim-Subscription-Key is filled in automatically for the subscription key associated with this API.

Step 22- Select **Send** as shown in image 12.

Output -

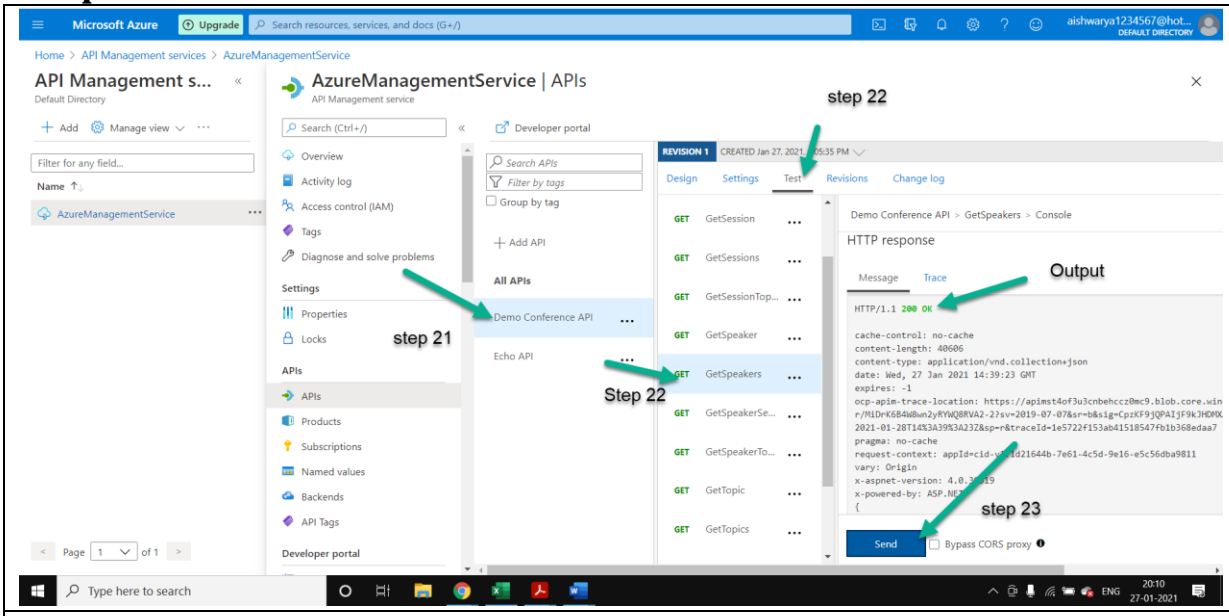


Image 12

As we can see in image 12 the Https response is “200 Ok with some data” which states that the backend can response.

b) Create an API Gateway Service.

Steps for creating an API gateway service are mentioned below-

Step 1- Sign in to you **AWS account**.
Step 2- search **for API Gateway**, and create an AWS Gateway instance as shown in Image 1.

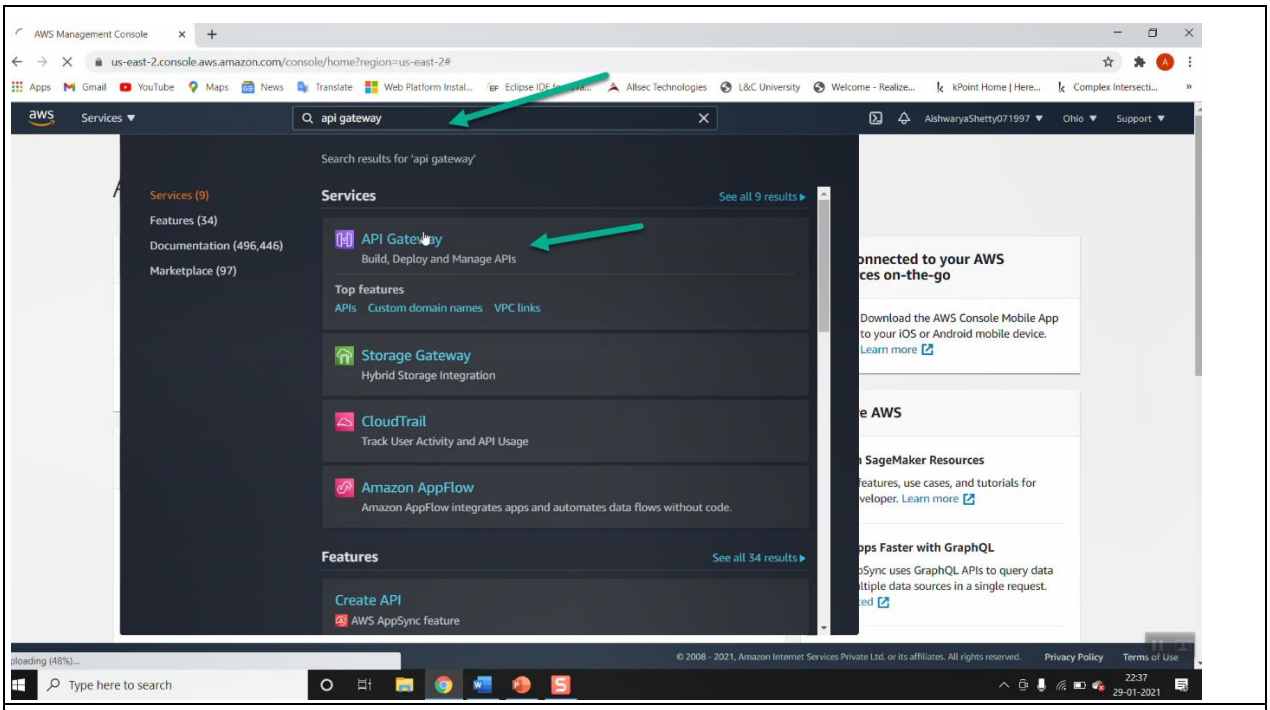


Image 1

Step 3- Select Import from the REST API selection as shown in image 2.

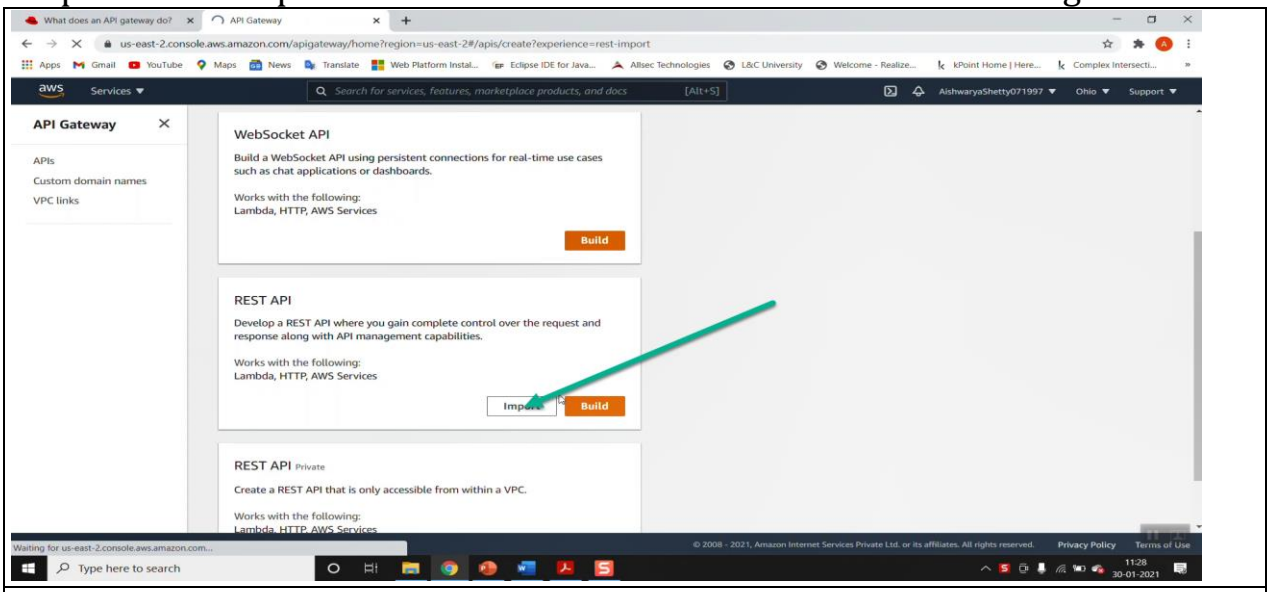


Image 2

Step 4- Select Import from swagger and copy or select the swagger file as shown in image 3.

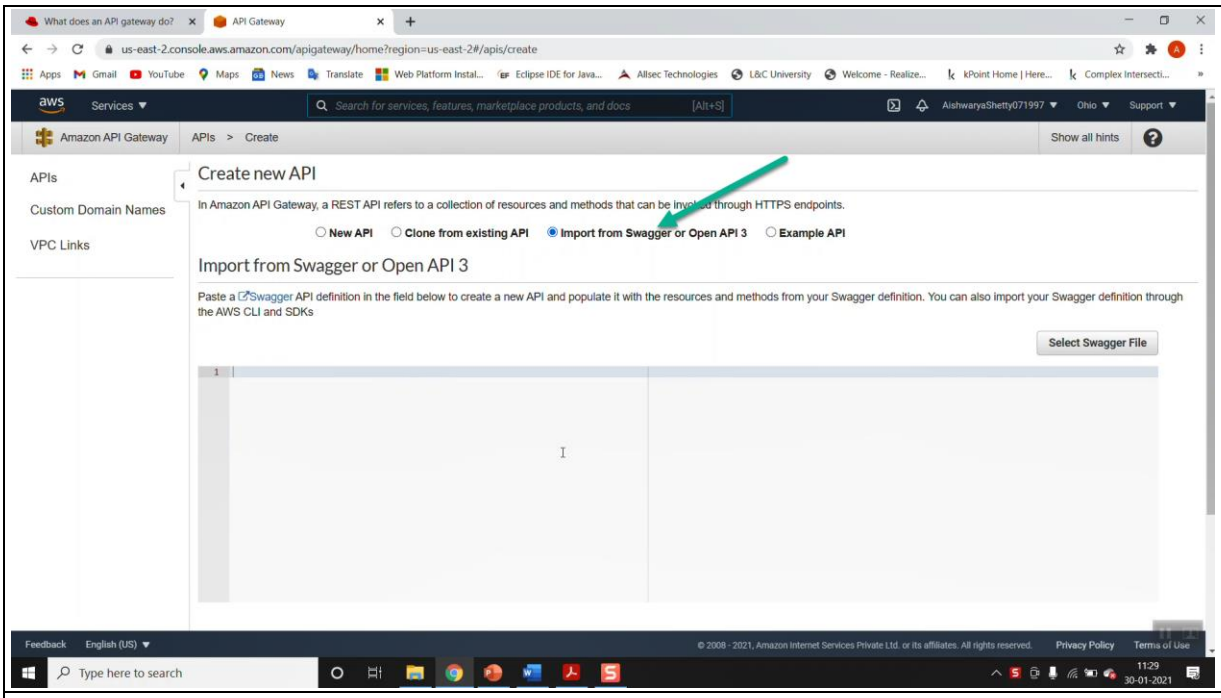


Image 3

Step 5- To Create an API definition in Swagger. First login to the swagger account. As depicted in image 4.

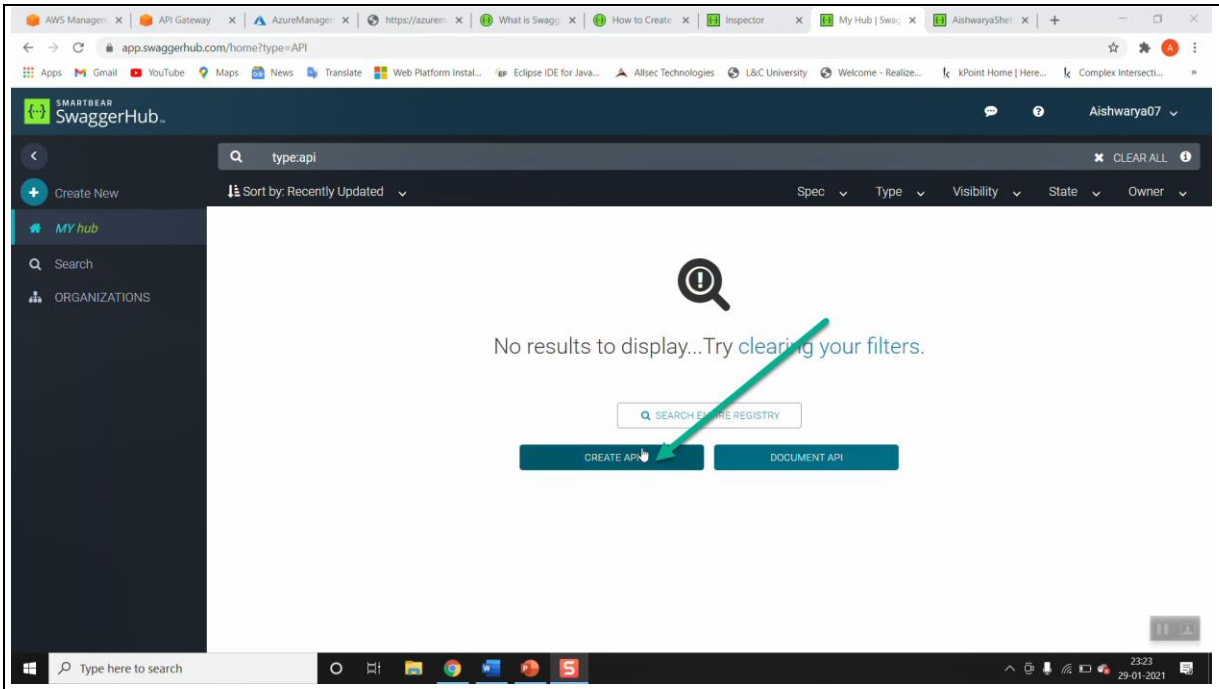


Image 4

Step 6- Then fill the Form which includes the version, name and other details click on Create API button. As depicted in image 5.

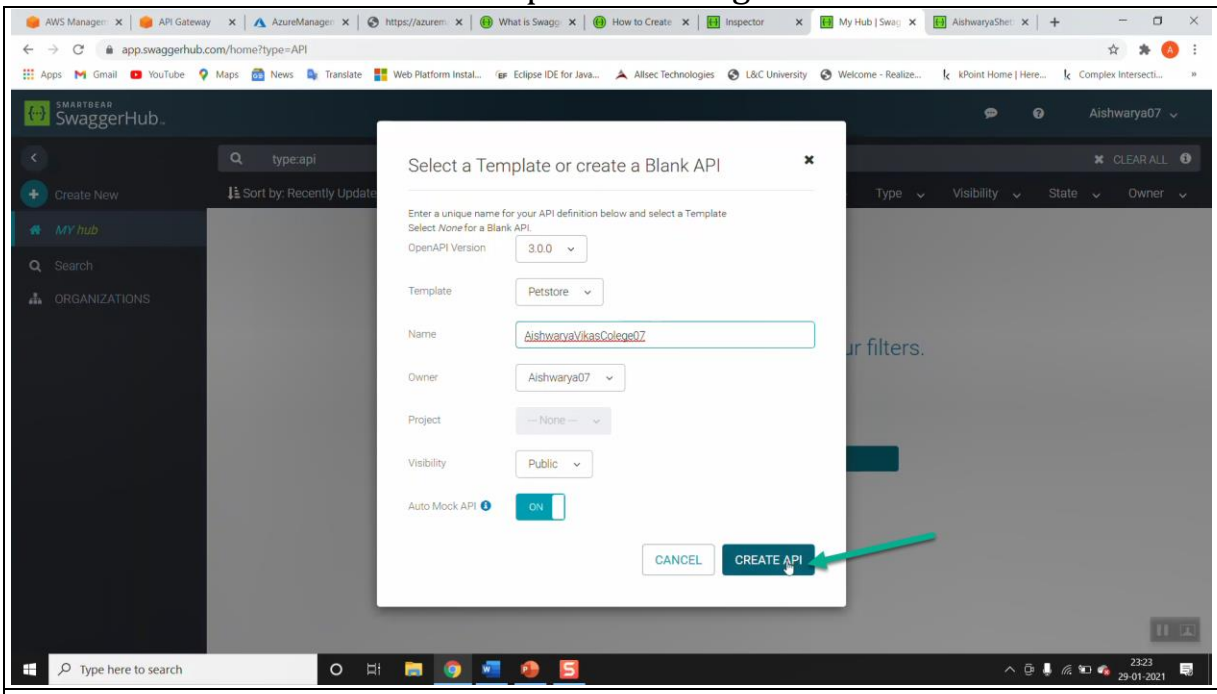


Image 5

Step 7- Copy the API and definition from swagger as shown in image 6

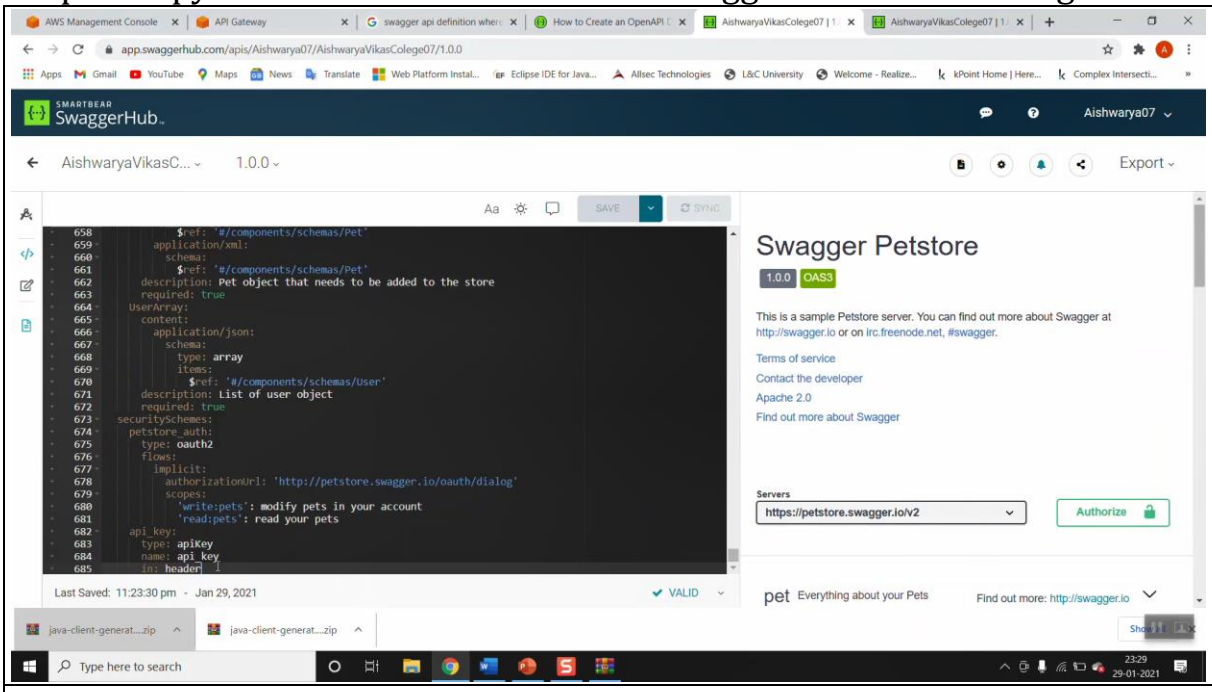


Image 6

Step 8-Paste the definition and in In the Settings section, select the endpoint type. Select "**Edge Optimized**" option and then click on import button as

shown in image 7

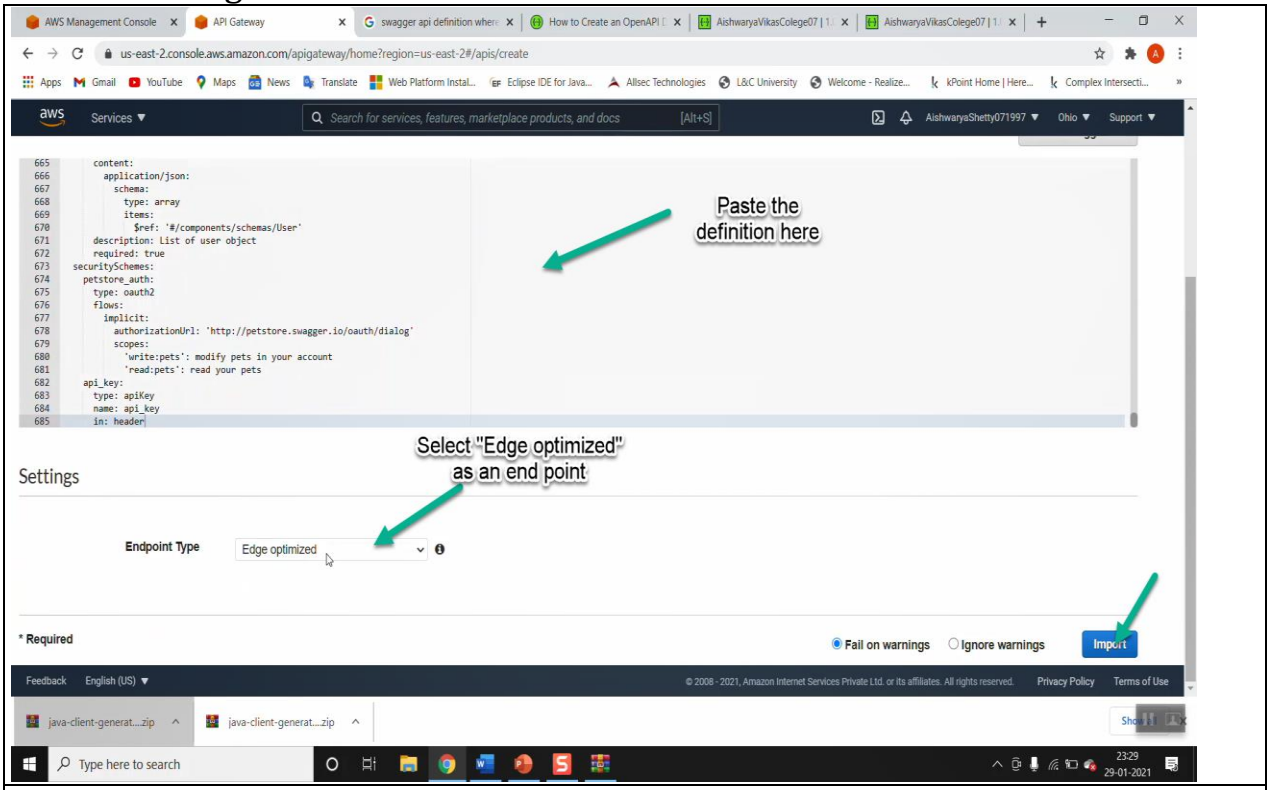


Image 7

API definition from swagger is mentioned below-

```
openapi: 3.0.0
info:
  description: |
    This is a sample Petstore server.  You can find
    out more about Swagger at
    [http://swagger.io](http://swagger.io) or on
    [irc.freenode.net, #swagger](http://swagger.io/irc/).
  version: "1.0.0"
  title: Swagger Petstore
  termsOfService: 'http://swagger.io/terms/'
  contact:
    email: apiteam@swagger.io
  license:
    name: Apache 2.0
    url: 'http://www.apache.org/licenses/LICENSE-2.0.html'
servers:
  # Added by API Auto Mocking Plugin
  - description: SwaggerHub API Auto Mocking
```

```
  url:
https://virtserver.swaggerhub.com/Aishwarya07/AishwaryaVikasColege07/1
.0.0
 - url: 'https://petstore.swagger.io/v2'
tags:
 - name: pet
   description: Everything about your Pets
   externalDocs:
     description: Find out more
     url: 'http://swagger.io'
 - name: store
   description: Access to Petstore orders
 - name: user
   description: Operations about user
   externalDocs:
     description: Find out more about our store
     url: 'http://swagger.io'
paths:
 /pet:
   post:
     tags:
       - pet
     summary: Add a new pet to the store
     operationId: addPet
     responses:
       '405':
         description: Invalid input
     security:
       - petstore_auth:
           - 'write:pets'
           - 'read:pets'
     requestBody:
       $ref: '#/components/requestBodies/Pet'
   put:
     tags:
       - pet
     summary: Update an existing pet
     operationId: updatePet
     responses:
```

```
      '400':
        description: Invalid ID supplied
      '404':
        description: Pet not found
      '405':
        description: Validation exception
    security:
      - petstore_auth:
          - 'write:pets'
          - 'read:pets'
    requestBody:
      $ref: '#/components/requestBodies/Pet'
  /pet/findByStatus:
    get:
      tags:
        - pet
      summary: Finds Pets by status
      description: Multiple status values can be provided with comma separated
strings
      operationId: findPetsByStatus
      parameters:
        - name: status
          in: query
          description: Status values that need to be considered for filter
          required: true
          explode: true
          schema:
            type: array
            items:
              type: string
              enum:
                - available
                - pending
                - sold
            default: available
      responses:
        '200':
          description: successful operation
          content:
```

```
        application/json:
          schema:
            type: array
            items:
              $ref: '#/components/schemas/Pet'
        application/xml:
          schema:
            type: array
            items:
              $ref: '#/components/schemas/Pet'
    '400':
      description: Invalid status value
  security:
    - petstore_auth:
        - 'write:pets'
        - 'read:pets'
/pet/findByTags:
 get:
  tags:
    - pet
  summary: Finds Pets by tags
  description: >-
    Muliple tags can be provided with comma separated strings. Use\ \ tag1,
    tag2, tag3 for testing.
  operationId: findPetsByTags
  parameters:
    - name: tags
      in: query
      description: Tags to filter by
      required: true
      explode: true
      schema:
        type: array
        items:
          type: string
  responses:
    '200':
      description: successful operation
      content:
```

```
        application/json:
          schema:
            type: array
            items:
              $ref: '#/components/schemas/Pet'
        application/xml:
          schema:
            type: array
            items:
              $ref: '#/components/schemas/Pet'
    '400':
      description: Invalid tag value
  security:
    - petstore_auth:
        - 'write:pets'
        - 'read:pets'
  deprecated: true
'/pet/{petId}':
 get:
  tags:
    - pet
  summary: Find pet by ID
  description: Returns a single pet
  operationId: getPetById
  parameters:
    - name: petId
      in: path
      description: ID of pet to return
      required: true
      schema:
        type: integer
        format: int64
  responses:
    '200':
      description: successful operation
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/Pet'
```

```
      application/xml:
        schema:
          $ref: '#/components/schemas/Pet'
    '400':
      description: Invalid ID supplied
    '404':
      description: Pet not found
  security:
    - api_key: []
post:
  tags:
    - pet
  summary: Updates a pet in the store with form data
  operationId: updatePetWithForm
  parameters:
    - name: petId
      in: path
      description: ID of pet that needs to be updated
      required: true
      schema:
        type: integer
        format: int64
  responses:
    '405':
      description: Invalid input
  security:
    - petstore_auth:
        - 'write:pets'
        - 'read:pets'
  requestBody:
    content:
      application/x-www-form-urlencoded:
        schema:
          type: object
          properties:
            name:
              description: Updated name of the pet
              type: string
            status:
```

```
            description: Updated status of the pet
            type: string
    delete:
      tags:
        - pet
      summary: Deletes a pet
      operationId: deletePet
      parameters:
        - name: api_key
          in: header
          required: false
          schema:
            type: string
        - name: petId
          in: path
          description: Pet id to delete
          required: true
          schema:
            type: integer
            format: int64
      responses:
        '400':
          description: Invalid ID supplied
        '404':
          description: Pet not found
      security:
        - petstore_auth:
            - 'write:pets'
            - 'read:pets'
  '/pet/{petId}/uploadImage':
    post:
      tags:
        - pet
      summary: uploads an image
      operationId: uploadFile
      parameters:
        - name: petId
          in: path
          description: ID of pet to update
```

```
      required: true
      schema:
        type: integer
        format: int64
    responses:
      '200':
        description: successful operation
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ApiResponse'
    security:
      - petstore_auth:
          - 'write:pets'
          - 'read:pets'
    requestBody:
      content:
        application/octet-stream:
          schema:
            type: string
            format: binary
  /store/inventory:
    get:
      tags:
        - store
      summary: Returns pet inventories by status
      description: Returns a map of status codes to quantities
      operationId: getInventory
      responses:
        '200':
          description: successful operation
          content:
            application/json:
              schema:
                type: object
                additionalProperties:
                  type: integer
                  format: int32
      security:
```

```
    - api_key: []
/store/order:
  post:
    tags:
     - store
    summary: Place an order for a pet
    operationId: placeOrder
    responses:
     '200':
      description: successful operation
      content:
       application/json:
        schema:
         $ref: '#/components/schemas/Order'
       application/xml:
        schema:
         $ref: '#/components/schemas/Order'
     '400':
      description: Invalid Order
    requestBody:
     content:
      application/json:
       schema:
        $ref: '#/components/schemas/Order'
     description: order placed for purchasing the pet
     required: true
'/store/order/{orderId}':
  get:
    tags:
     - store
    summary: Find purchase order by ID
    description: >-
     For valid response try integer IDs with value >= 1 and <= 10.\ \ Other
     values will generated exceptions
    operationId: getOrderById
    parameters:
     - name: orderId
      in: path
      description: ID of pet that needs to be fetched
```

```
    required: true
    schema:
      type: integer
      format: int64
      minimum: 1
      maximum: 10
  responses:
   '200':
    description: successful operation
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/Order'
      application/xml:
        schema:
          $ref: '#/components/schemas/Order'
   '400':
    description: Invalid ID supplied
   '404':
    description: Order not found
delete:
  tags:
   - store
  summary: Delete purchase order by ID
  description: >-
   For valid response try integer IDs with positive integer value.\ \
   Negative or non-integer values will generate API errors
  operationId: deleteOrder
  parameters:
   - name: orderId
    in: path
    description: ID of the order that needs to be deleted
    required: true
    schema:
      type: integer
      format: int64
      minimum: 1
  responses:
   '400':
```

```
      description: Invalid ID supplied
    '404':
      description: Order not found
/user:
  post:
    tags:
     - user
    summary: Create user
    description: This can only be done by the logged in user.
    operationId: createUser
    responses:
     default:
       description: successful operation
    requestBody:
     content:
       application/json:
         schema:
           $ref: '#/components/schemas/User'
     description: Created user object
     required: true
/user/createWithArray:
  post:
    tags:
     - user
    summary: Creates list of users with given input array
    operationId: createUsersWithArrayInput
    responses:
     default:
       description: successful operation
    requestBody:
     $ref: '#/components/requestBodies/UserArray'
/user/createWithList:
  post:
    tags:
     - user
    summary: Creates list of users with given input array
    operationId: createUsersWithListInput
    responses:
     default:
```

```
      description: successful operation
    requestBody:
      $ref: '#/components/requestBodies/UserArray'
/user/login:
  get:
    tags:
      - user
    summary: Logs user into the system
    operationId: loginUser
    parameters:
      - name: username
        in: query
        description: The user name for login
        required: true
        schema:
          type: string
      - name: password
        in: query
        description: The password for login in clear text
        required: true
        schema:
          type: string
    responses:
      '200':
        description: successful operation
        headers:
          X-Rate-Limit:
            description: calls per hour allowed by the user
            schema:
              type: integer
              format: int32
          X-Expires-After:
            description: date in UTC when token expires
            schema:
              type: string
              format: date-time
        content:
          application/json:
            schema:
```

```
          type: string
        application/xml:
          schema:
            type: string
    '400':
      description: Invalid username/password supplied
/user/logout:
  get:
    tags:
      - user
    summary: Logs out current logged in user session
    operationId: logoutUser
    responses:
      default:
        description: successful operation
'/user/{username}':
  get:
    tags:
      - user
    summary: Get user by user name
    operationId: getUserByName
    parameters:
      - name: username
        in: path
        description: The name that needs to be fetched. Use user1 for testing.
        required: true
        schema:
          type: string
    responses:
      '200':
        description: successful operation
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/User'
          application/xml:
            schema:
              $ref: '#/components/schemas/User'
      '400':
```

```
      description: Invalid username supplied
    '404':
      description: User not found
put:
  tags:
    - user
  summary: Updated user
  description: This can only be done by the logged in user.
  operationId: updateUser
  parameters:
    - name: username
      in: path
      description: name that need to be updated
      required: true
      schema:
        type: string
  responses:
    '400':
      description: Invalid user supplied
    '404':
      description: User not found
  requestBody:
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/User'
    description: Updated user object
    required: true
delete:
  tags:
    - user
  summary: Delete user
  description: This can only be done by the logged in user.
  operationId: deleteUser
  parameters:
    - name: username
      in: path
      description: The name that needs to be deleted
      required: true
```

```
        schema:
          type: string
      responses:
        '400':
          description: Invalid username supplied
        '404':
          description: User not found
externalDocs:
  description: Find out more about Swagger
  url: 'http://swagger.io'
components:
  schemas:
    Order:
      type: object
      properties:
        id:
          type: integer
          format: int64
        petId:
          type: integer
          format: int64
        quantity:
          type: integer
          format: int32
        shipDate:
          type: string
          format: date-time
        status:
          type: string
          description: Order Status
          enum:
            - placed
            - approved
            - delivered
        complete:
          type: boolean
          default: false
      xml:
        name: Order
```

```
Category:
  type: object
  properties:
    id:
      type: integer
      format: int64
    name:
      type: string
  xml:
    name: Category
User:
  type: object
  properties:
    id:
      type: integer
      format: int64
    username:
      type: string
    firstName:
      type: string
    lastName:
      type: string
    email:
      type: string
    password:
      type: string
    phone:
      type: string
    userStatus:
      type: integer
      format: int32
      description: User Status
  xml:
    name: User
Tag:
  type: object
  properties:
    id:
      type: integer
```

```
      format: int64
    name:
      type: string
  xml:
    name: Tag
Pet:
  type: object
  required:
    - name
    - photoUrls
  properties:
    id:
      type: integer
      format: int64
    category:
      $ref: '#/components/schemas/Category'
    name:
      type: string
      example: doggie
    photoUrls:
      type: array
      xml:
        name: photoUrl
        wrapped: true
      items:
        type: string
    tags:
      type: array
      xml:
        name: tag
        wrapped: true
      items:
        $ref: '#/components/schemas/Tag'
    status:
      type: string
      description: pet status in the store
      enum:
        - available
        - pending
```

```
        - sold
    xml:
      name: Pet
  ApiResponse:
    type: object
    properties:
      code:
        type: integer
        format: int32
      type:
        type: string
      message:
        type: string
requestBodies:
  Pet:
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/Pet'
      application/xml:
        schema:
          $ref: '#/components/schemas/Pet'
    description: Pet object that needs to be added to the store
    required: true
  UserArray:
    content:
      application/json:
        schema:
          type: array
          items:
            $ref: '#/components/schemas/User'
    description: List of user object
    required: true
securitySchemes:
  petstore_auth:
    type: oauth2
    flows:
      implicit:
        authorizationUrl: 'http://petstore.swagger.io/oauth/dialog'
```

```
    scopes:
      'write:pets': modify pets in your account
      'read:pets': read your pets
  api_key:
    type: apiKey
    name: api_key
    in: header
```

Output-

If the import is successful, we can view the ***"API Structure in AWS API Gateway"*** where we can see methods of the API. As shown in image 8

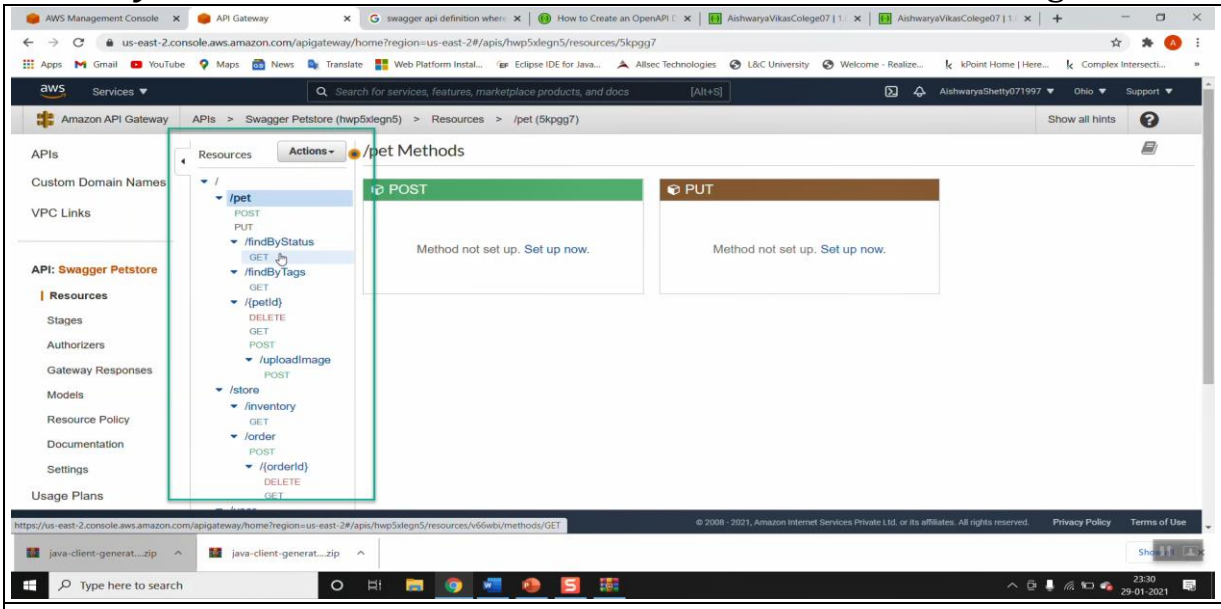


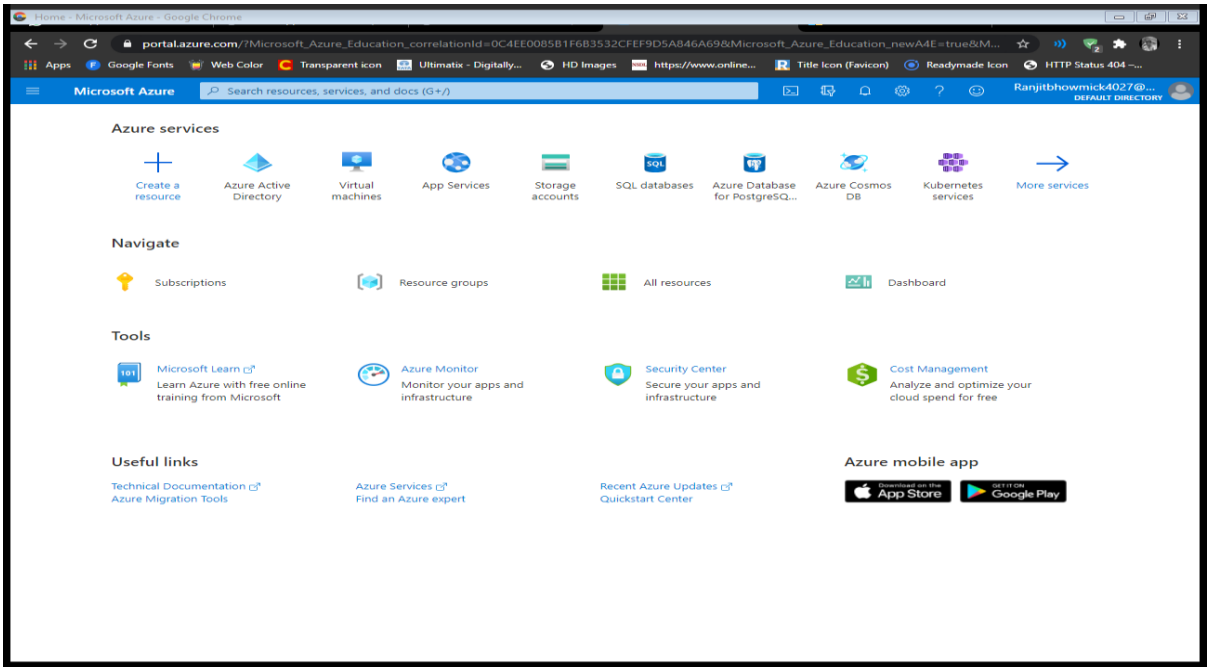
Image 8

PRACTICAL 9

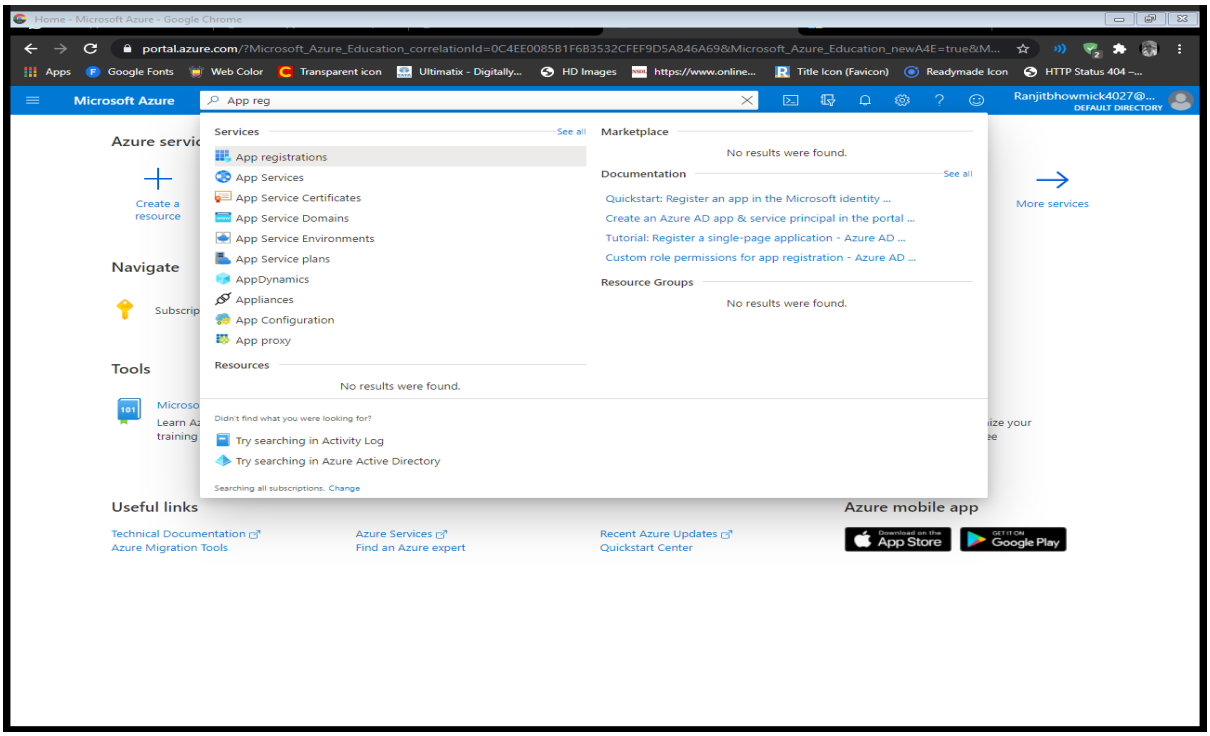
Securing APIs with Azure Active Directory

1. Register an application in Azure AD to represent the API

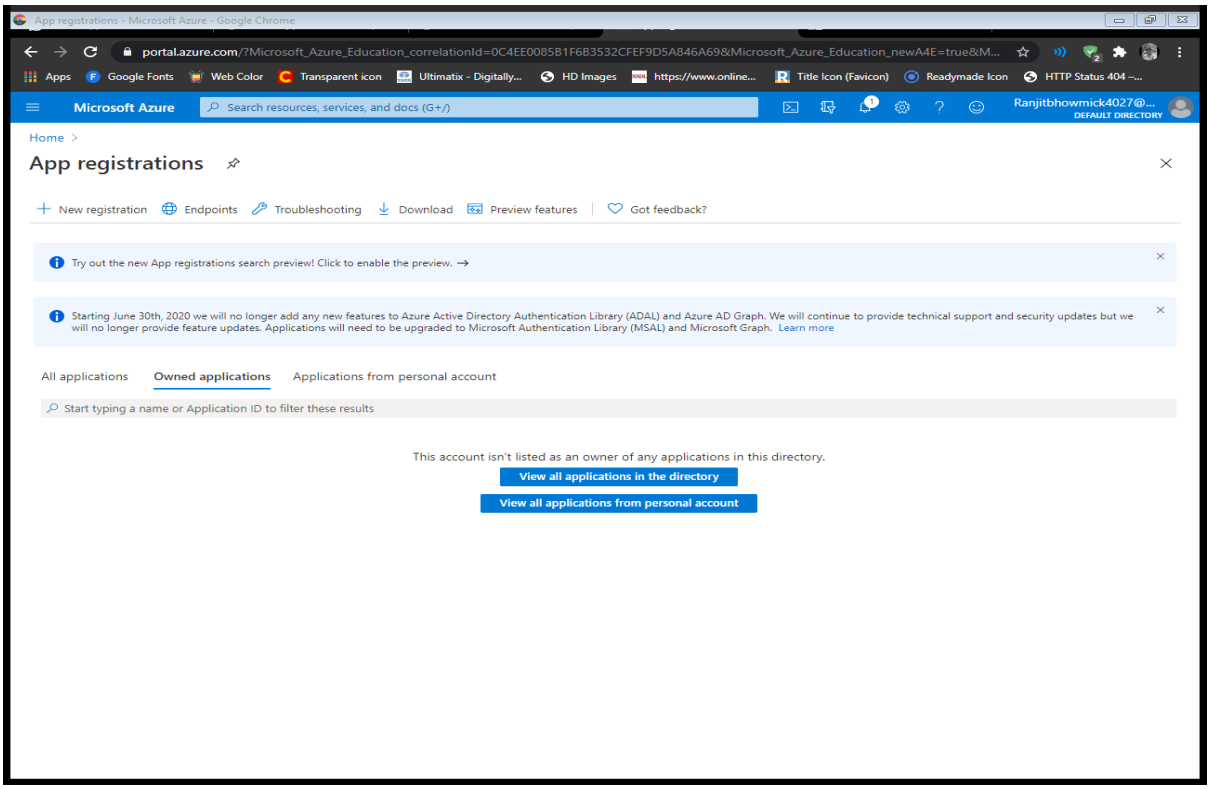
Visit Azure Portal -



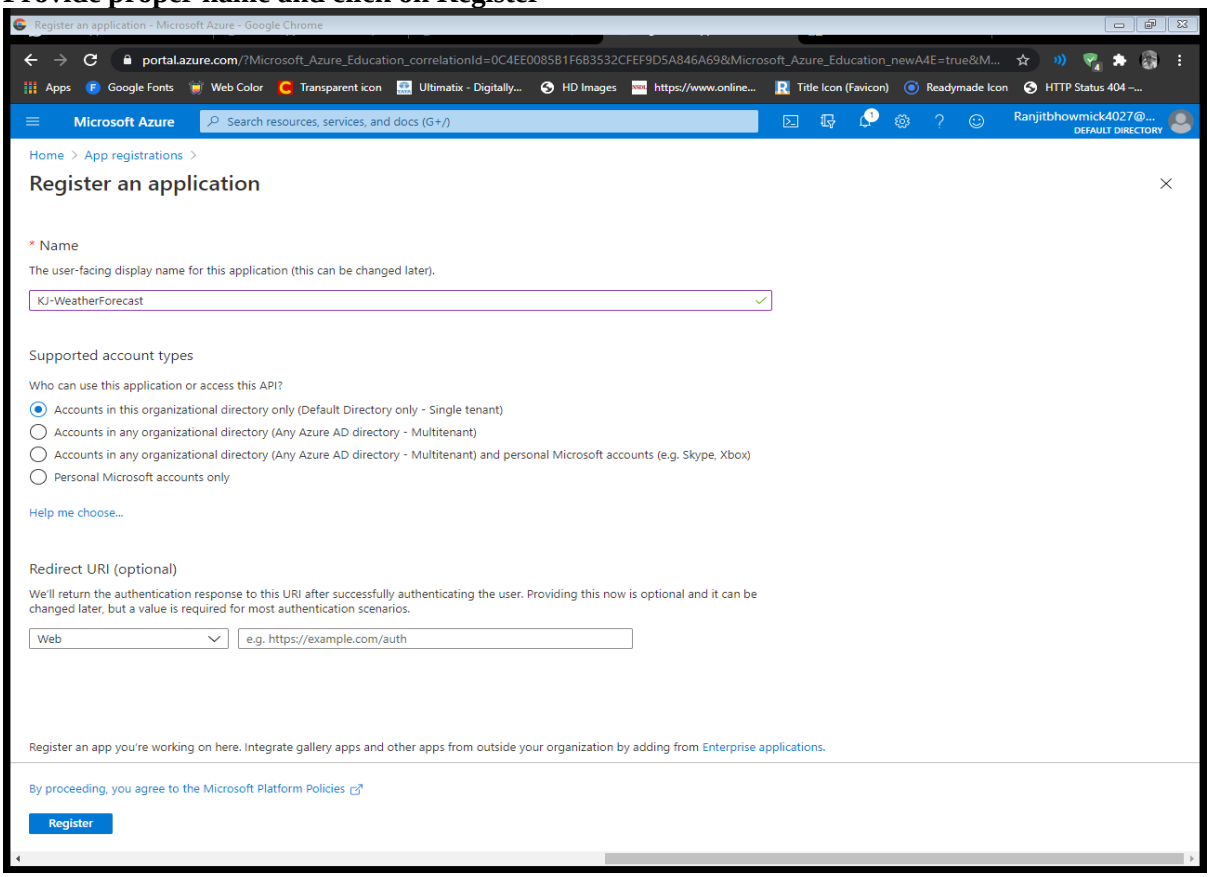
Search App Registration-



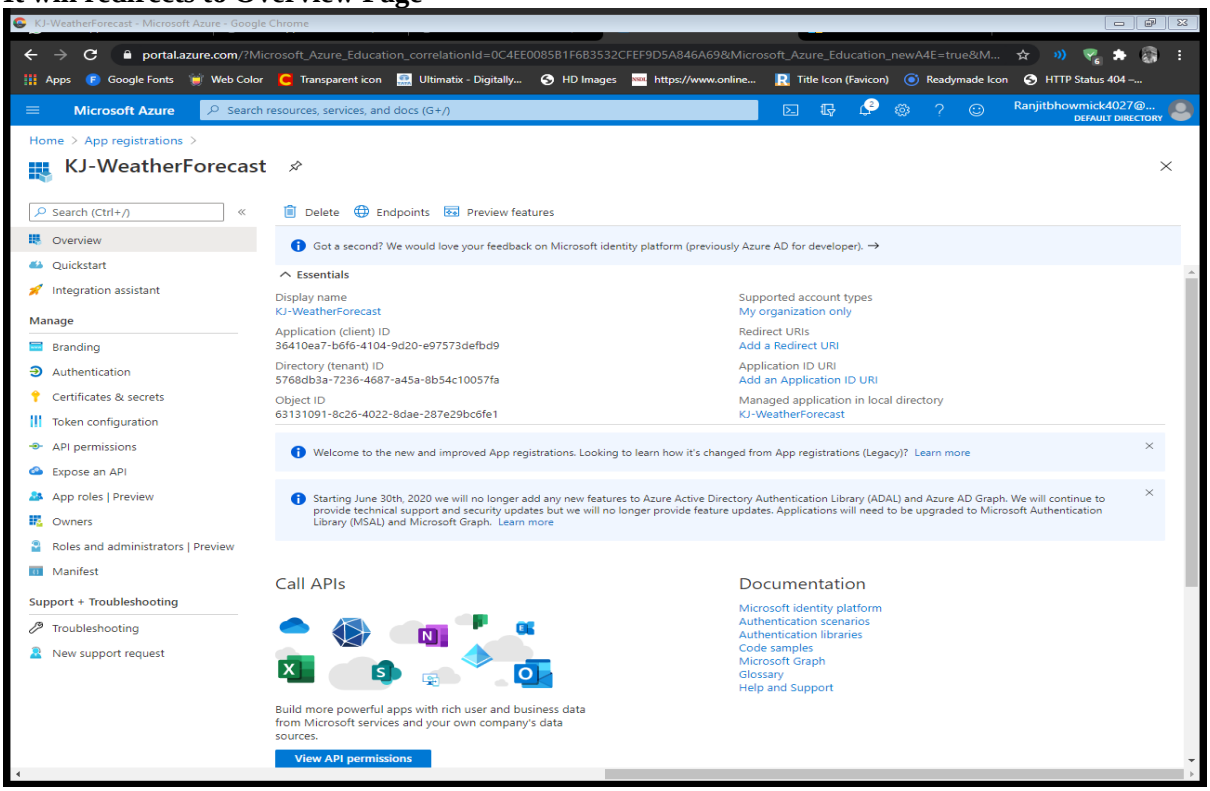
Click on New Registration-



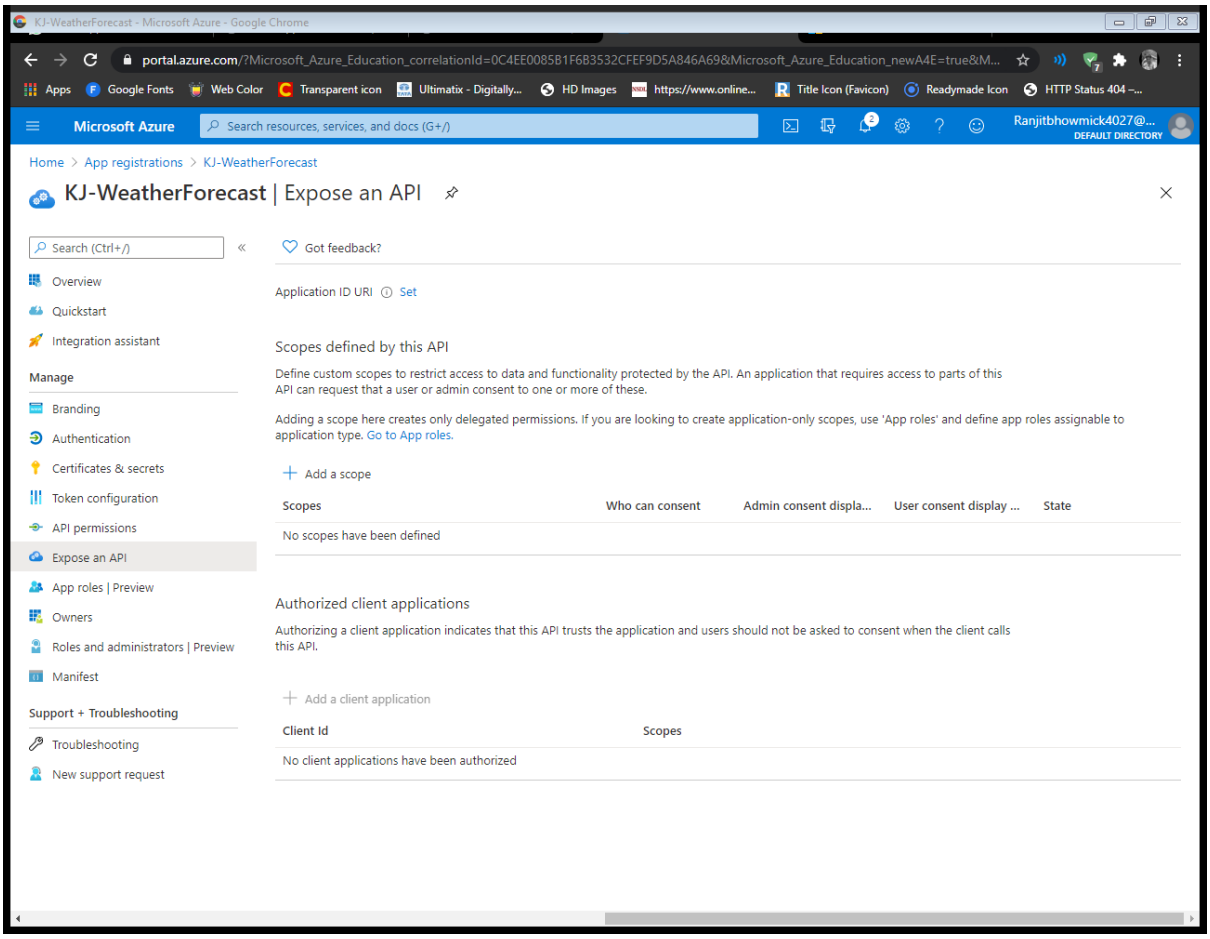
Provide proper name and click on Register –



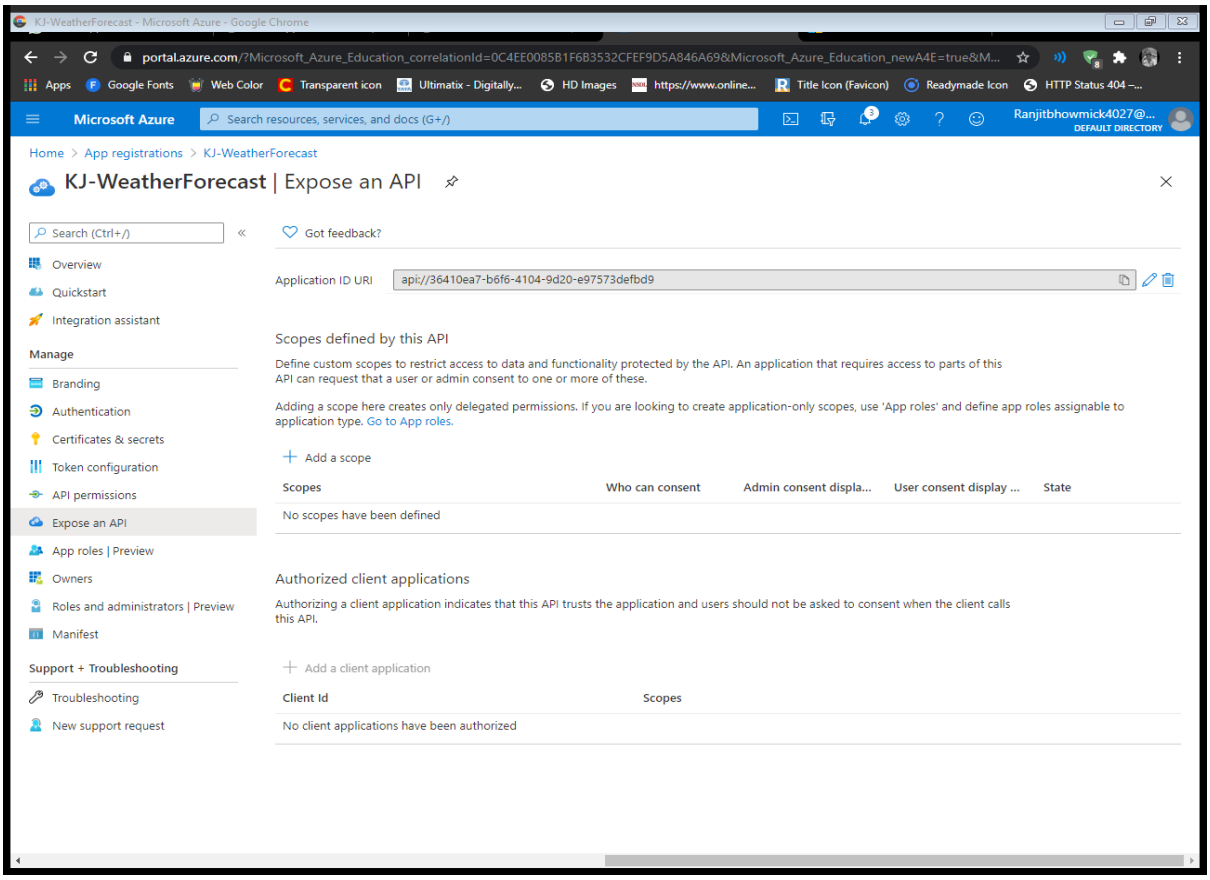
It will redirects to Overview Page –



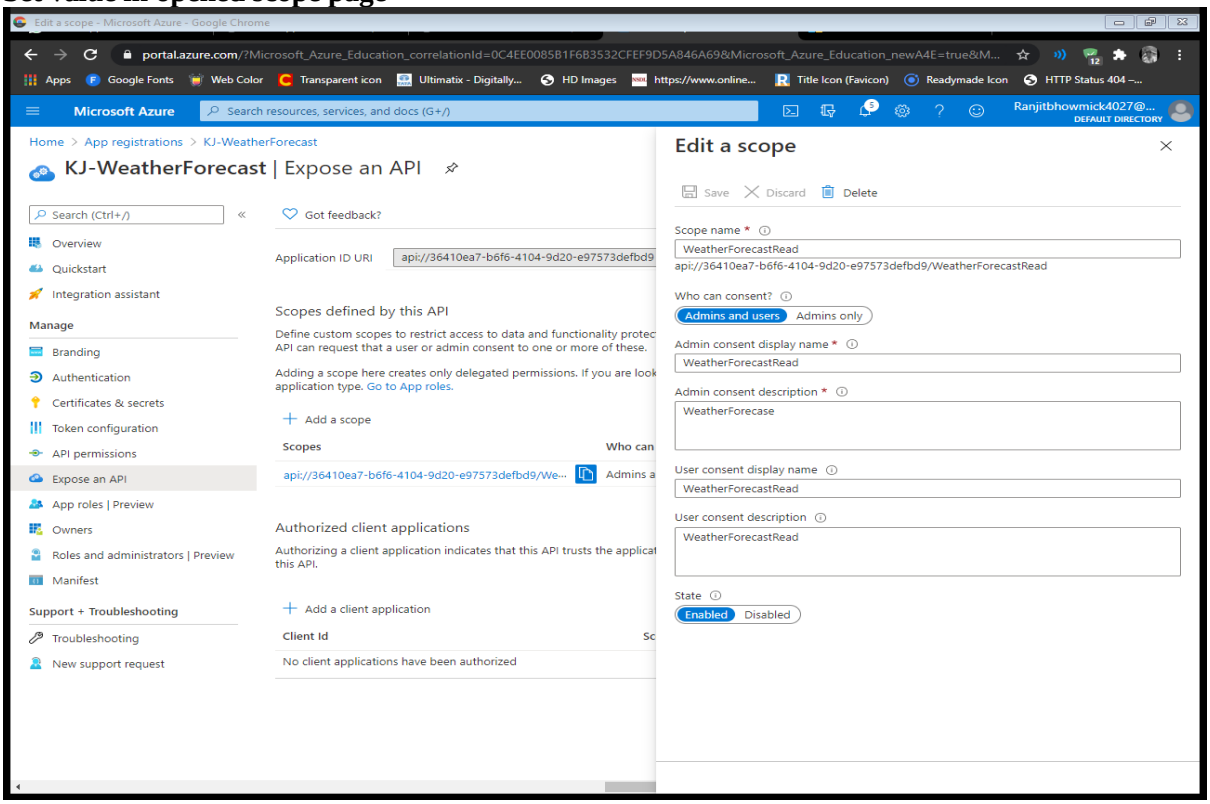
Select to Expose an API –



Set Default App URL-

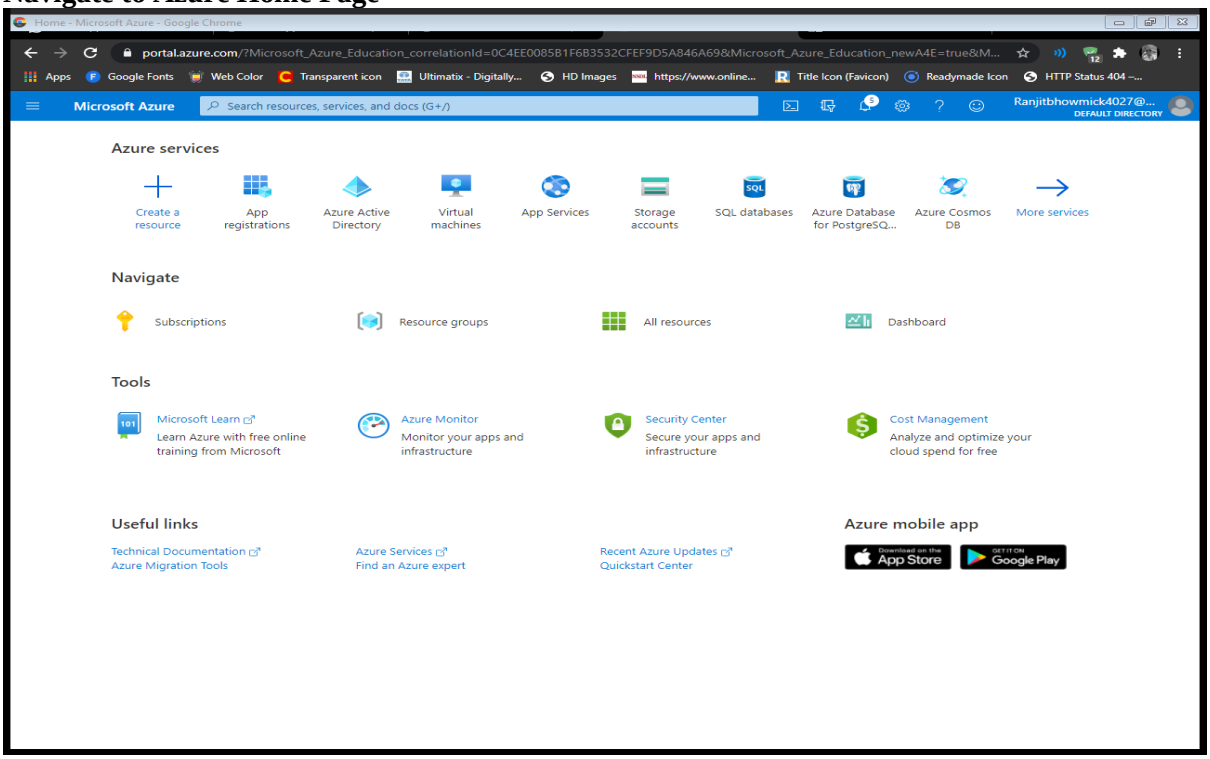


Set value in opened scope page –

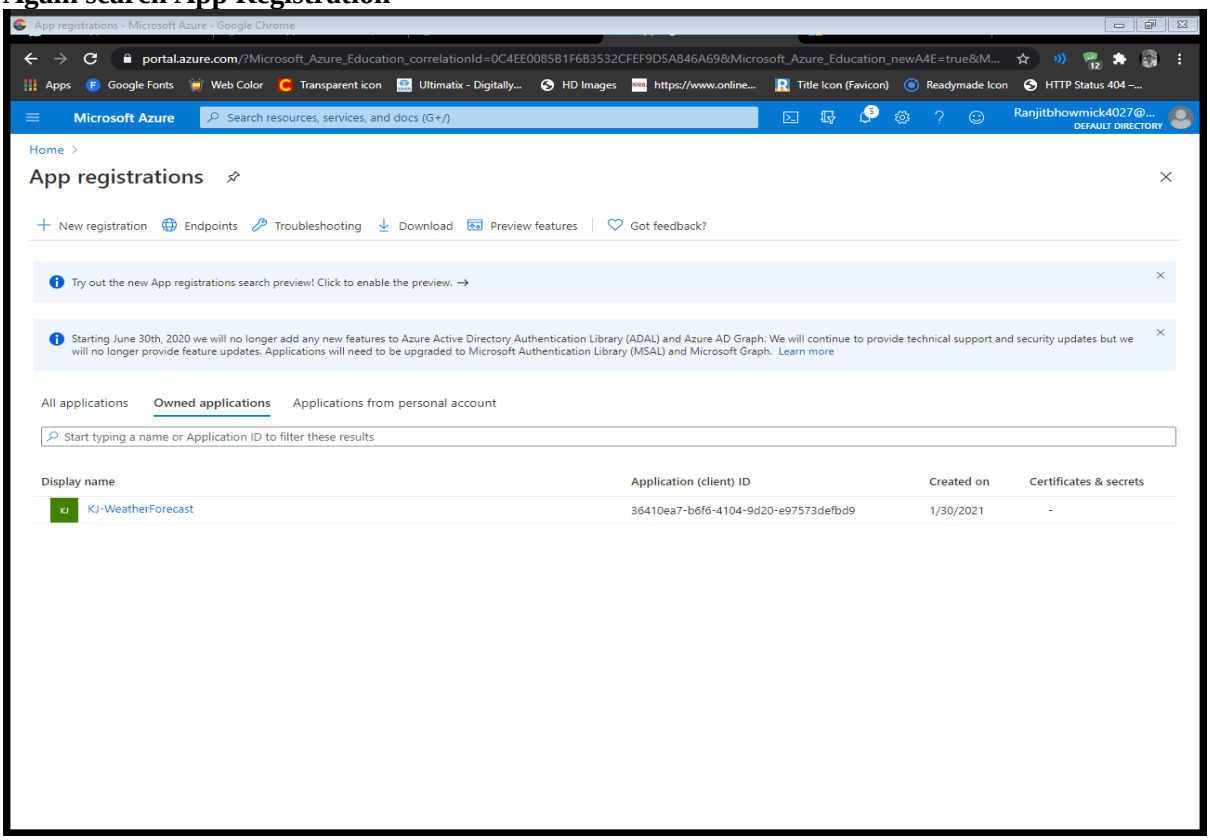


Register an application in Azure AD to represent a client Application –

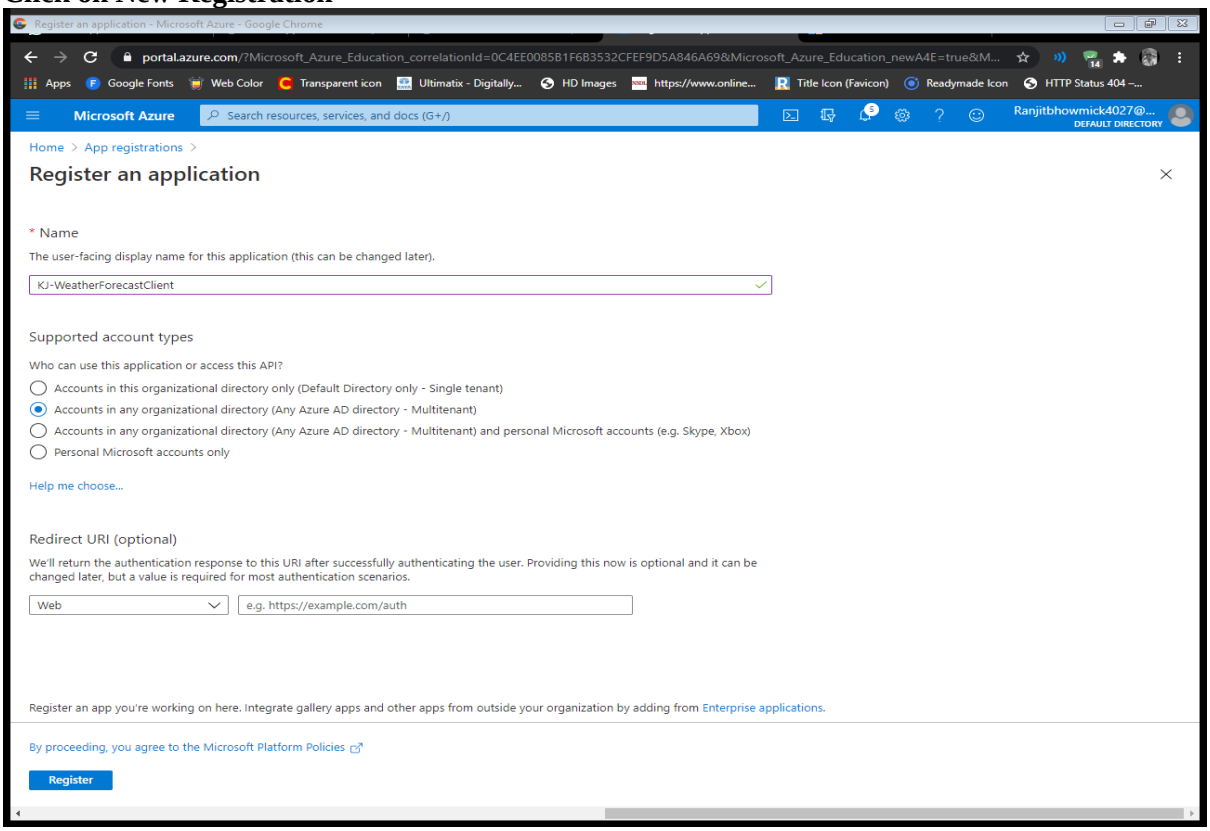
Navigate to Azure Home Page –



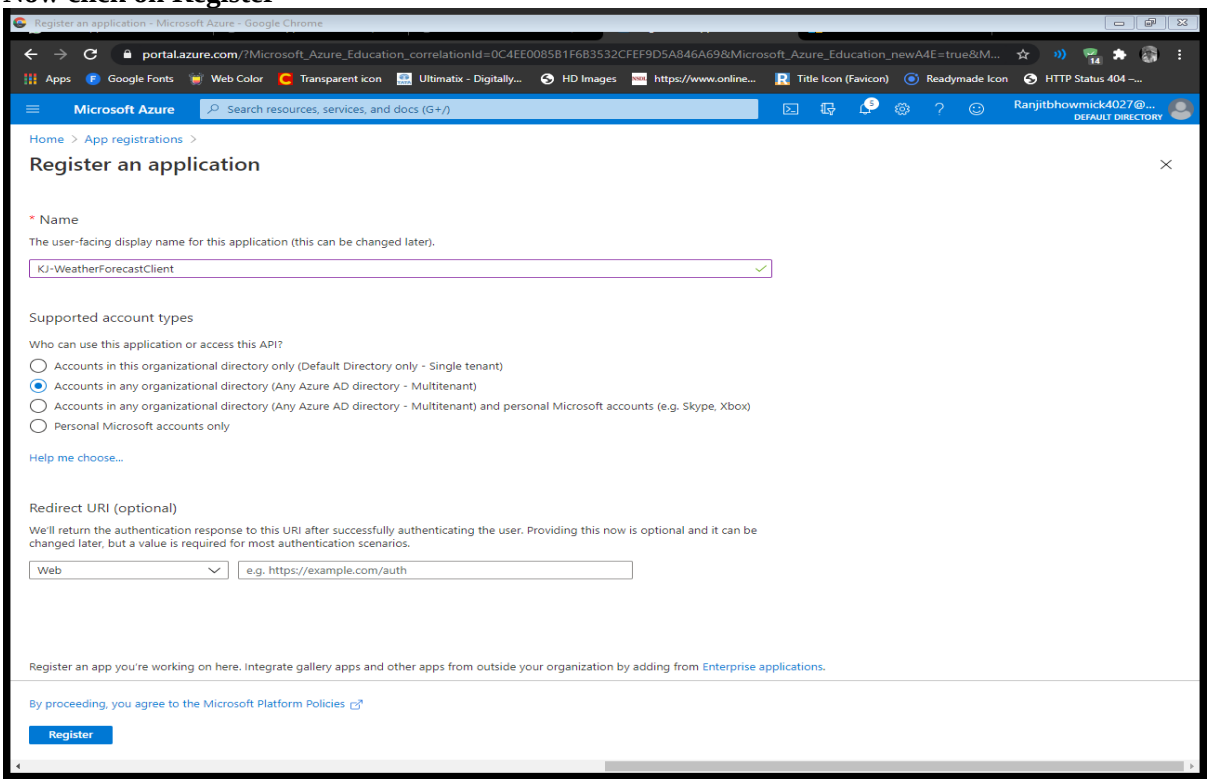
Again search App Registration –



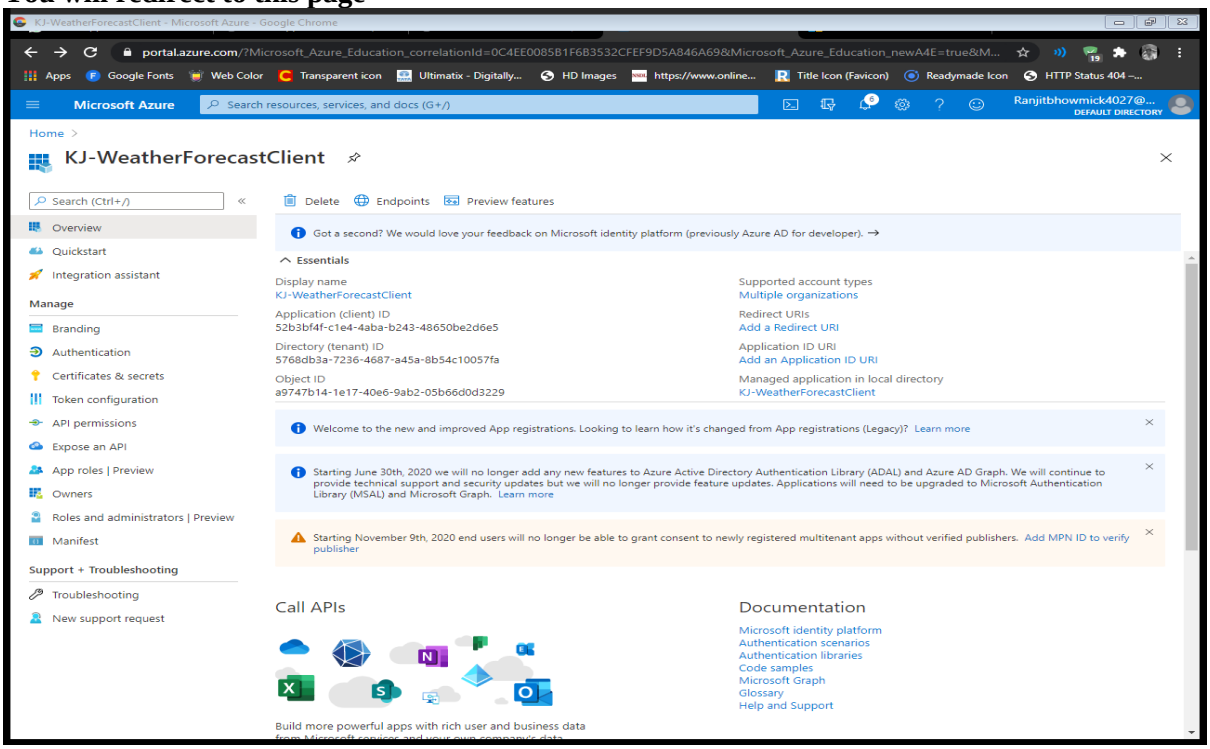
Click on New Registration



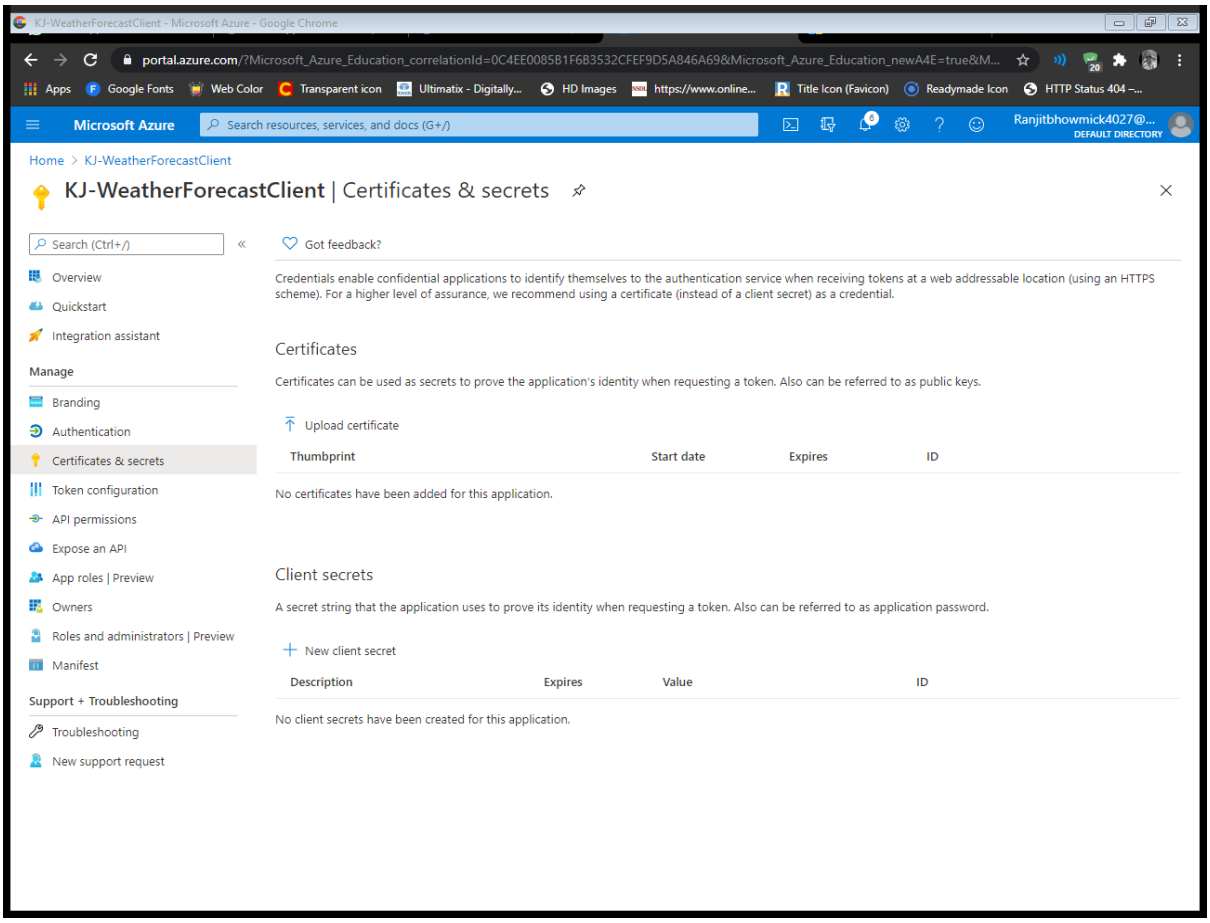
Now click on Register-



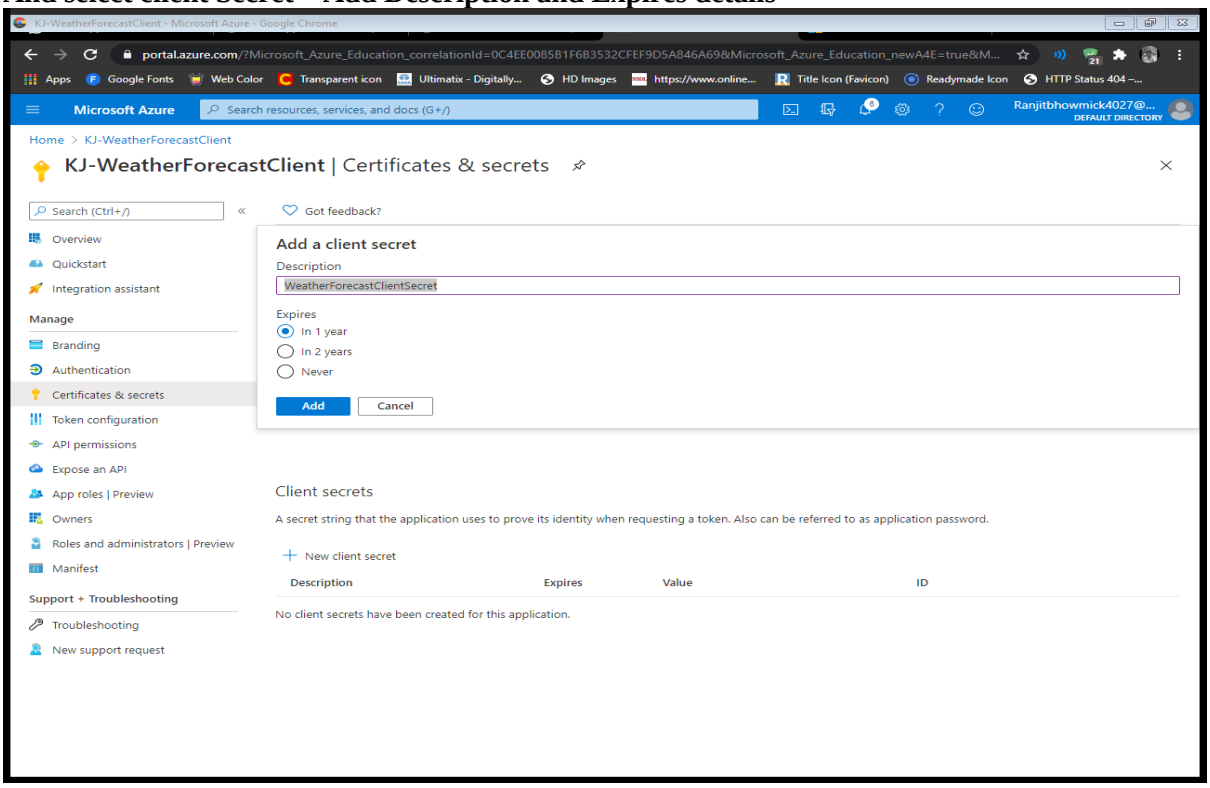
You will redirect to this page –

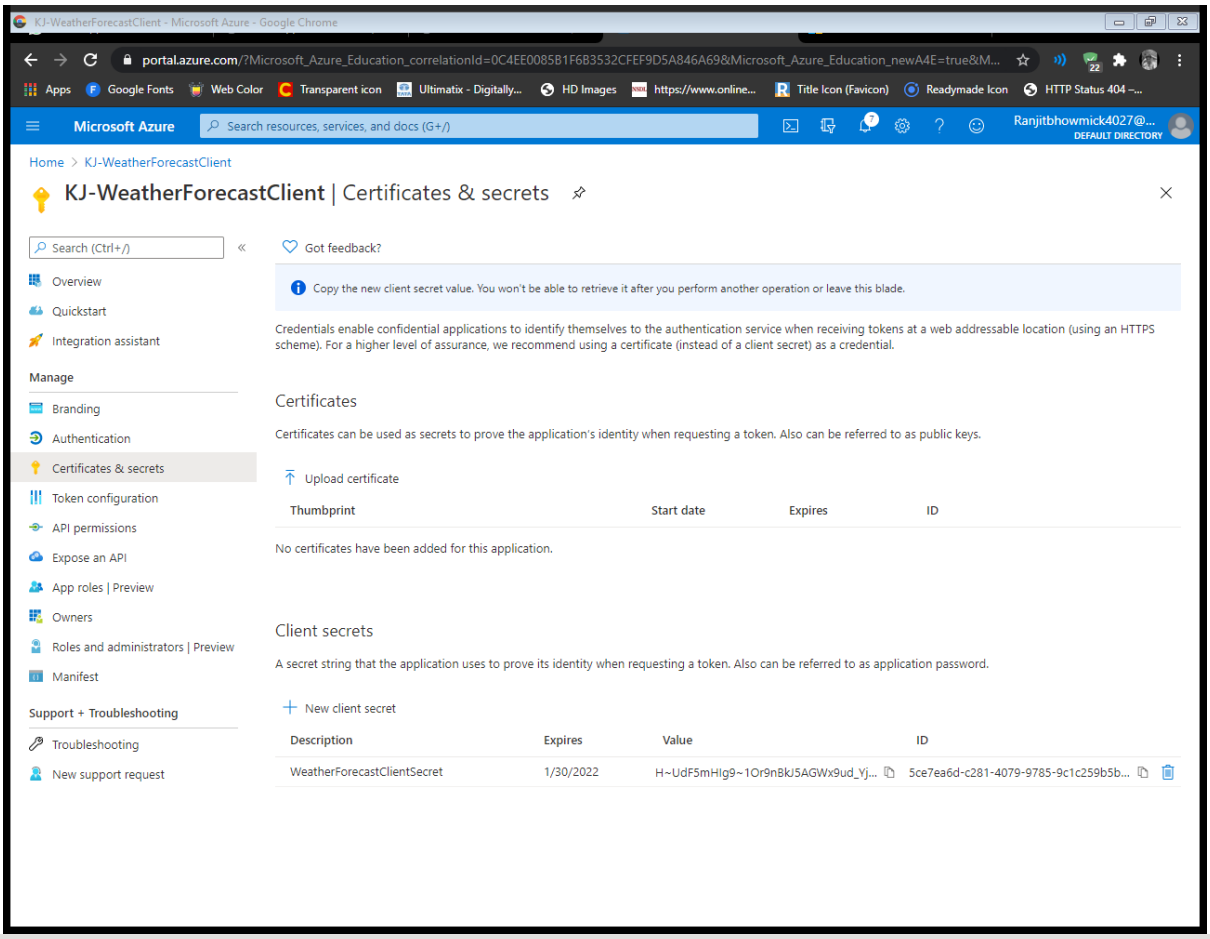


Select Certificate and Secrets –



And select client Secret – Add Description and Expires details-

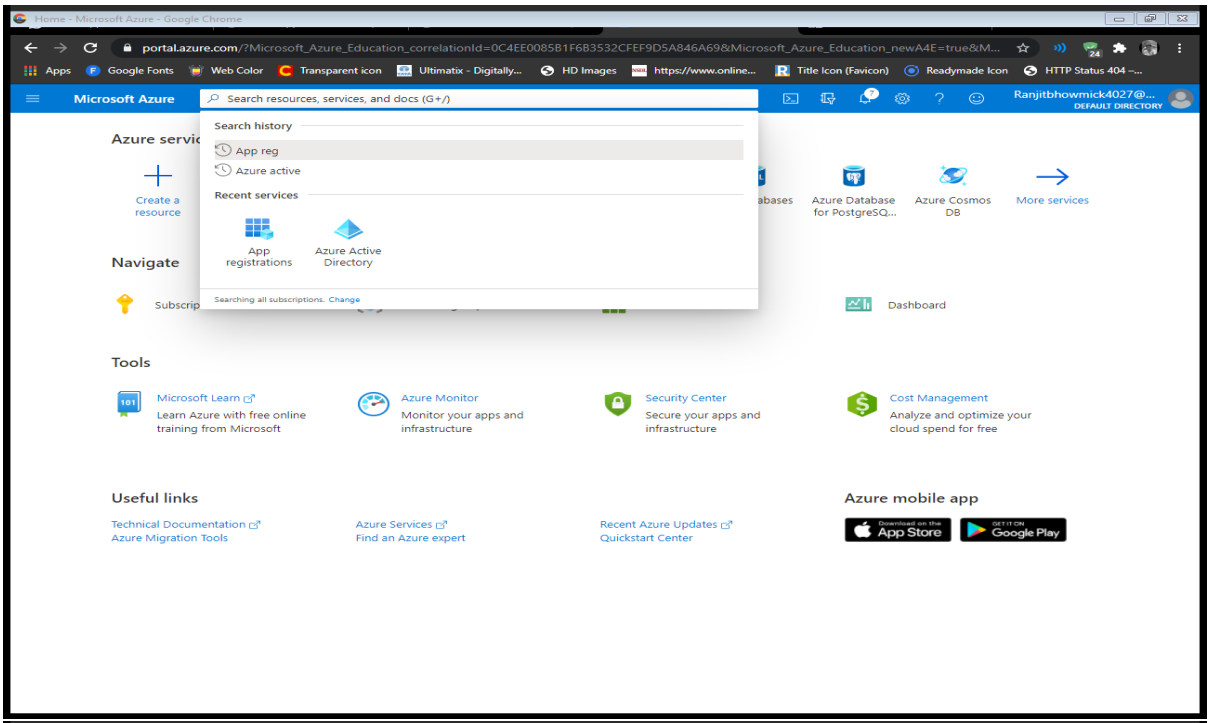


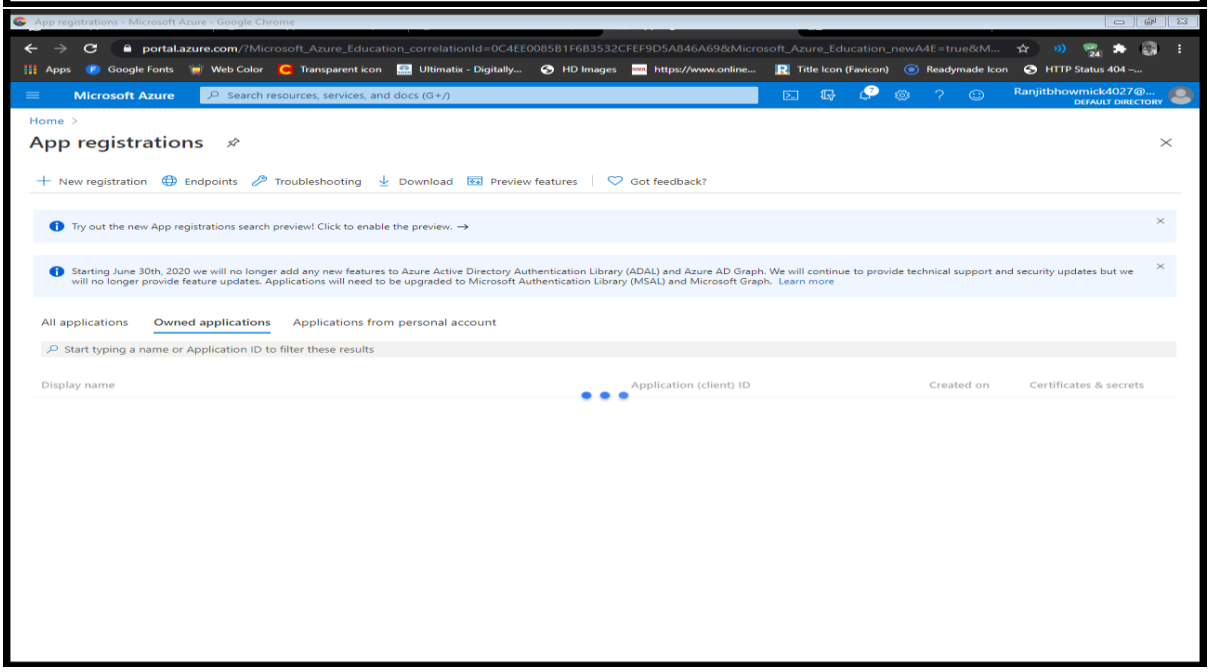


WeatherForecastClientSecret
1/30/2022
H~UdF5mHIg9~1Or9nBkJ5AGWx9ud_Yj7_-
5ce7ea6d-c281-4079-9785-9c1c259b5b26

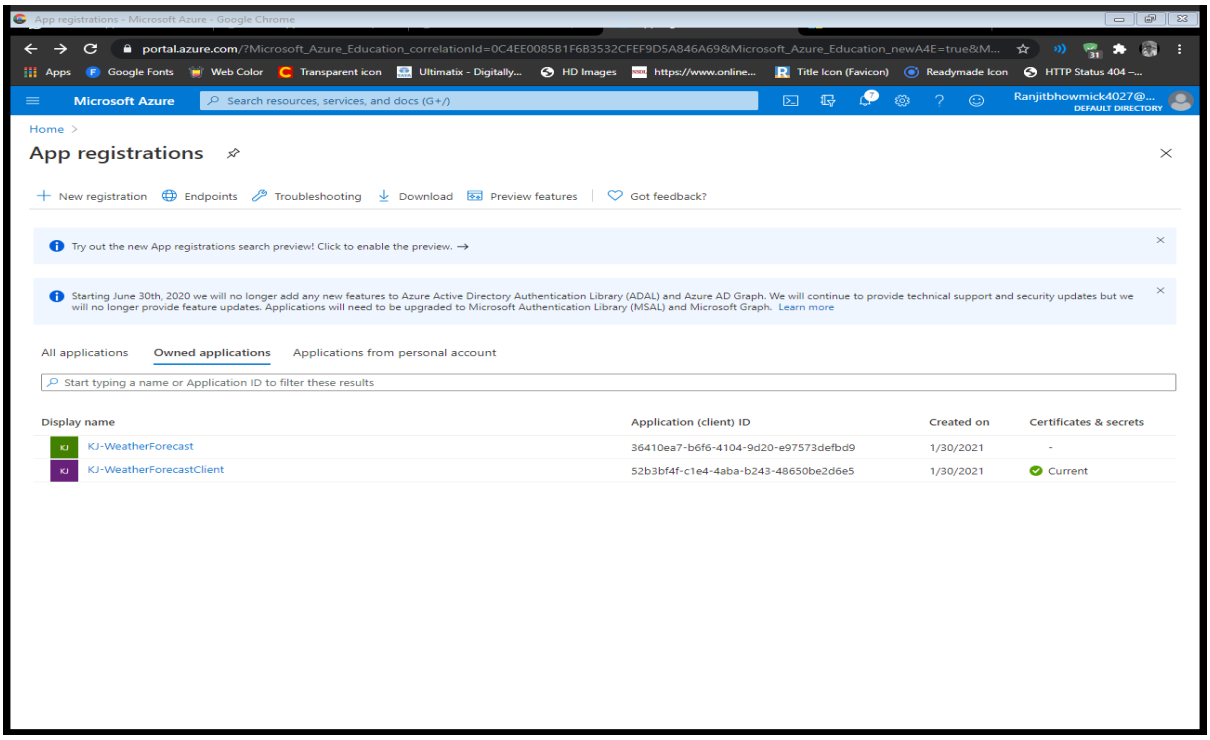
Grant Permission in Azure AD –

Navigate to Azure Portal –

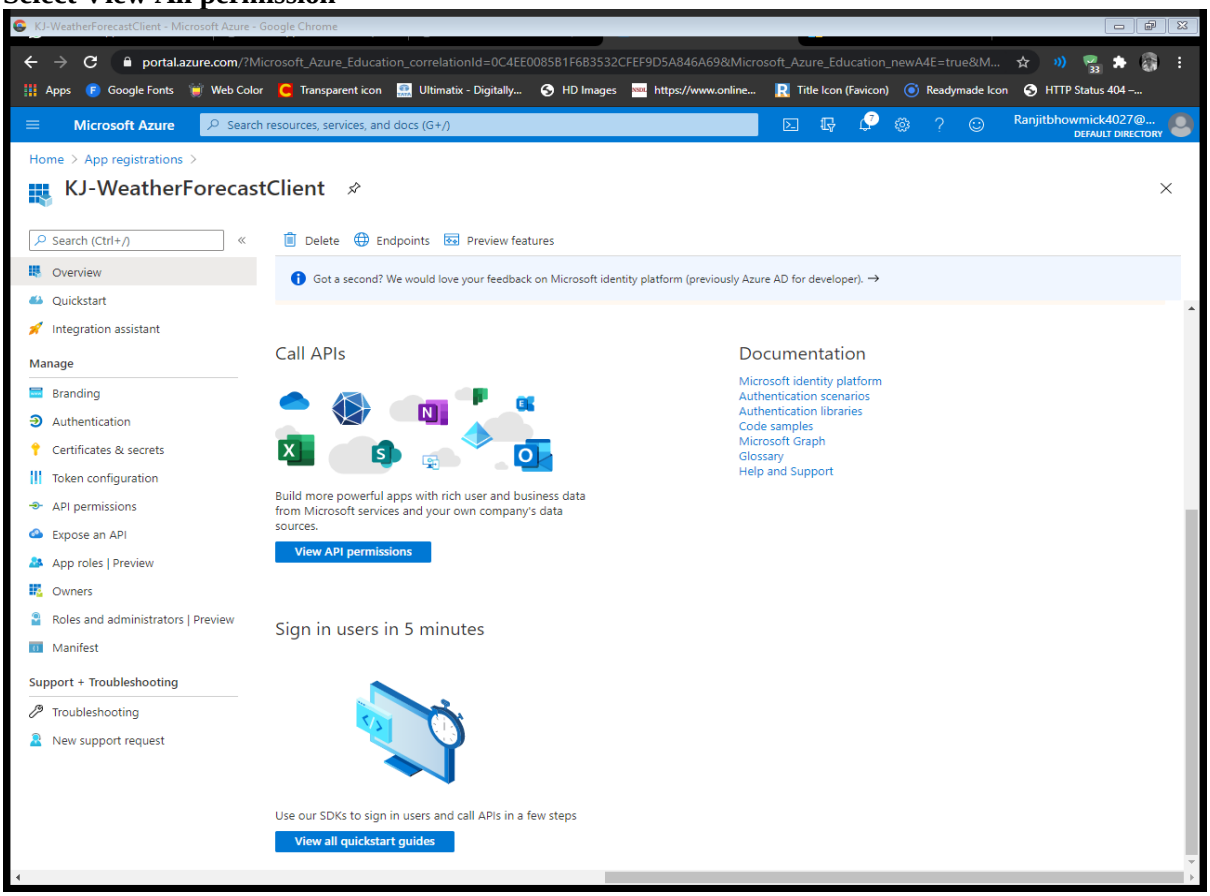




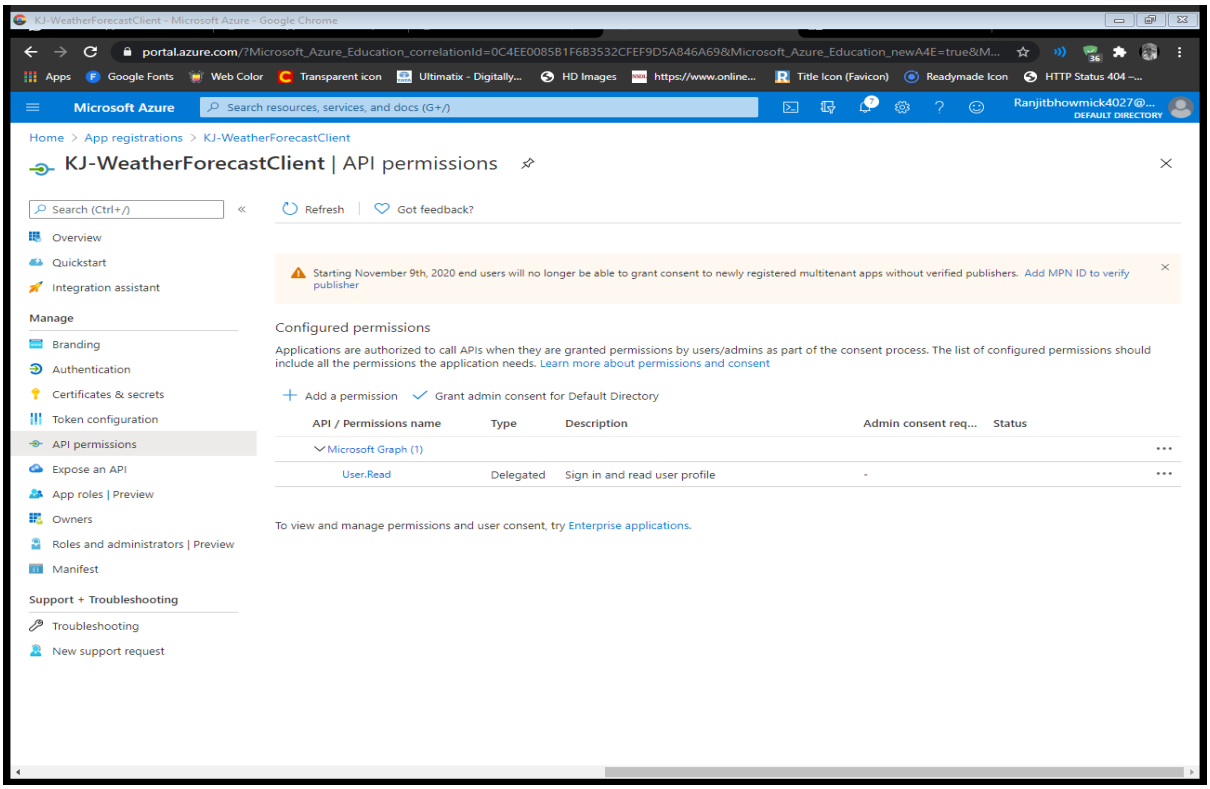
Choose your client app and grant permission –



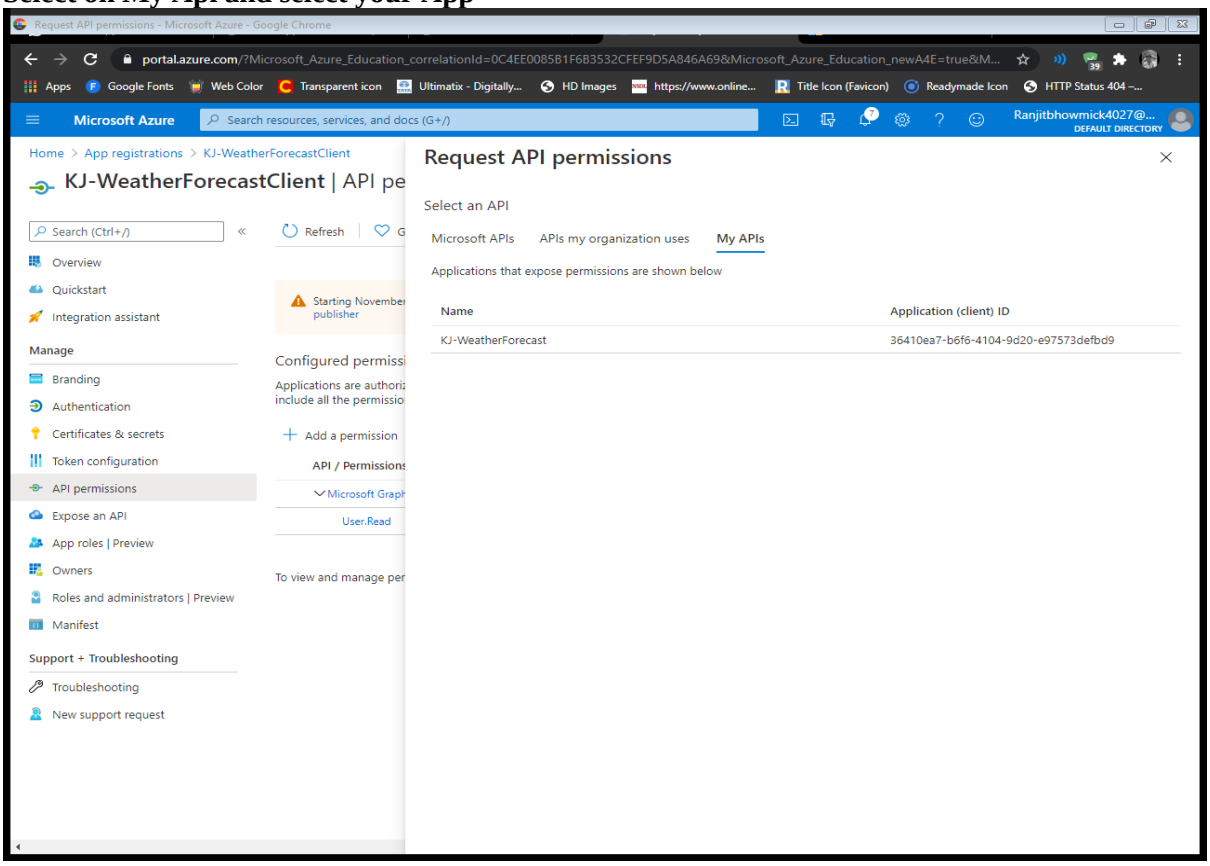
Select View All permission –



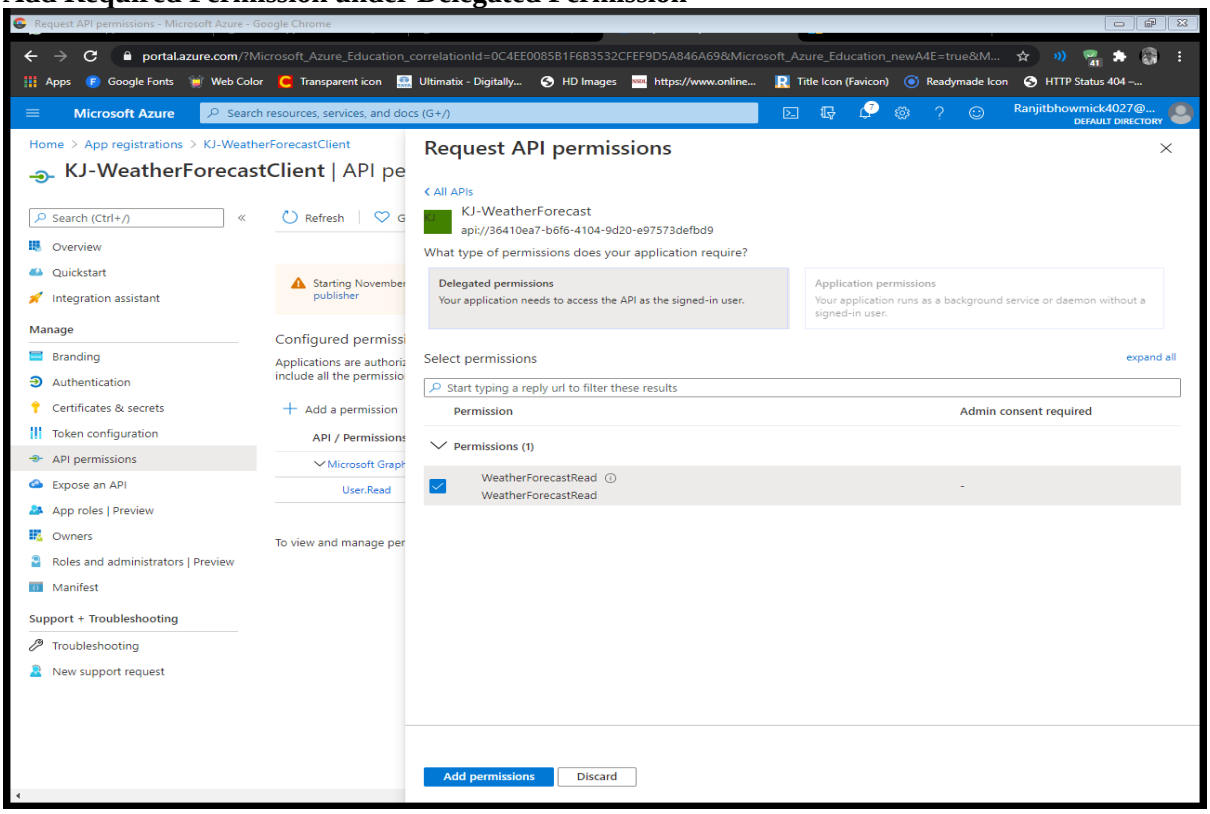
Click on Add permission –



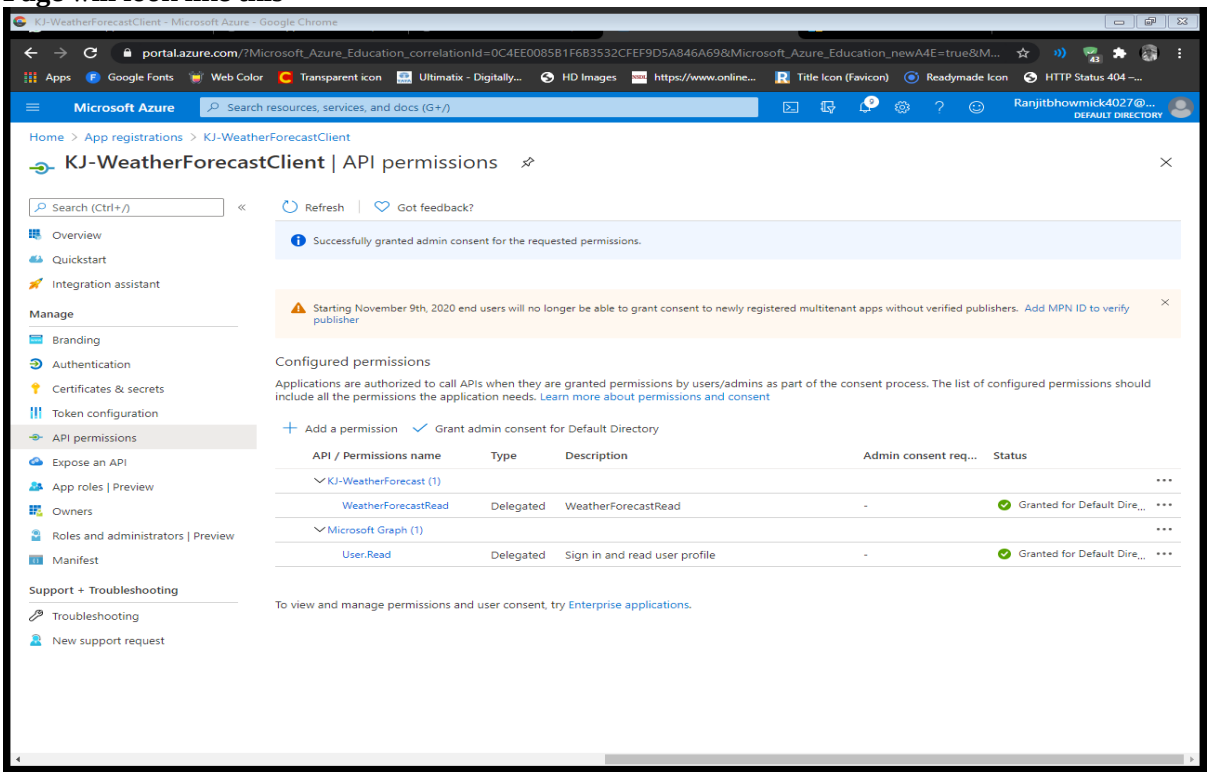
Select on My Api and select your App-



Add Required Permission under Delegated Permission –

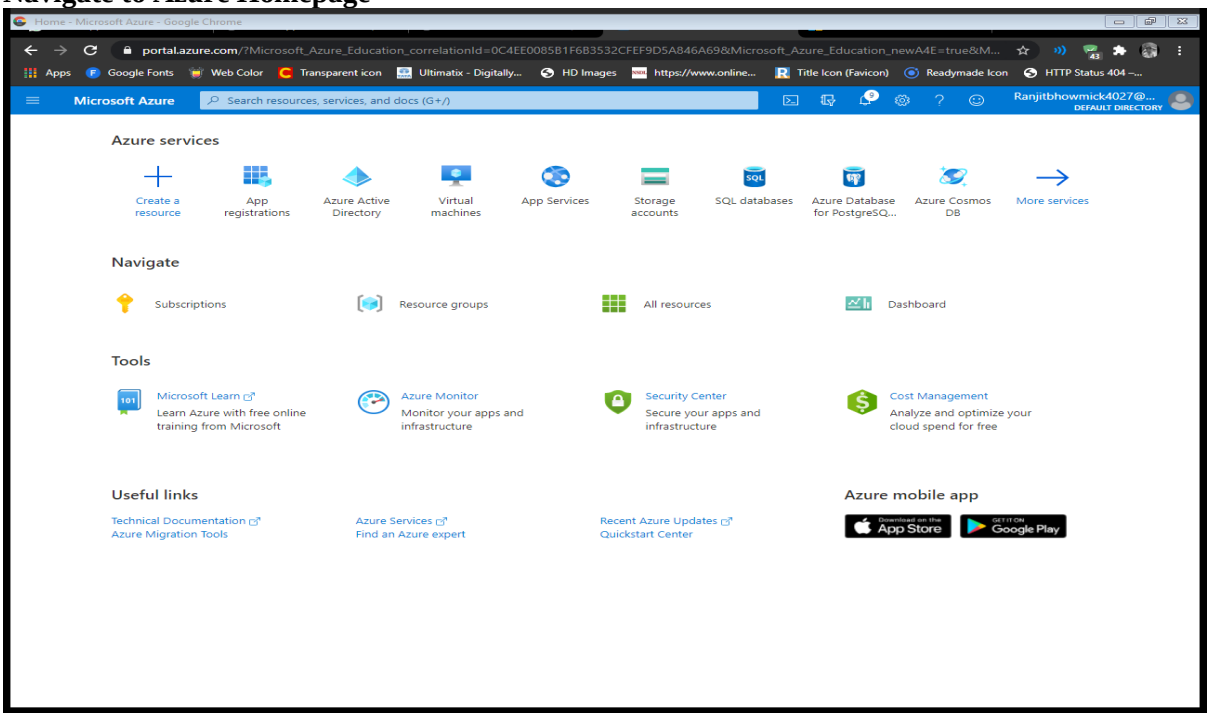


Page will look like this –

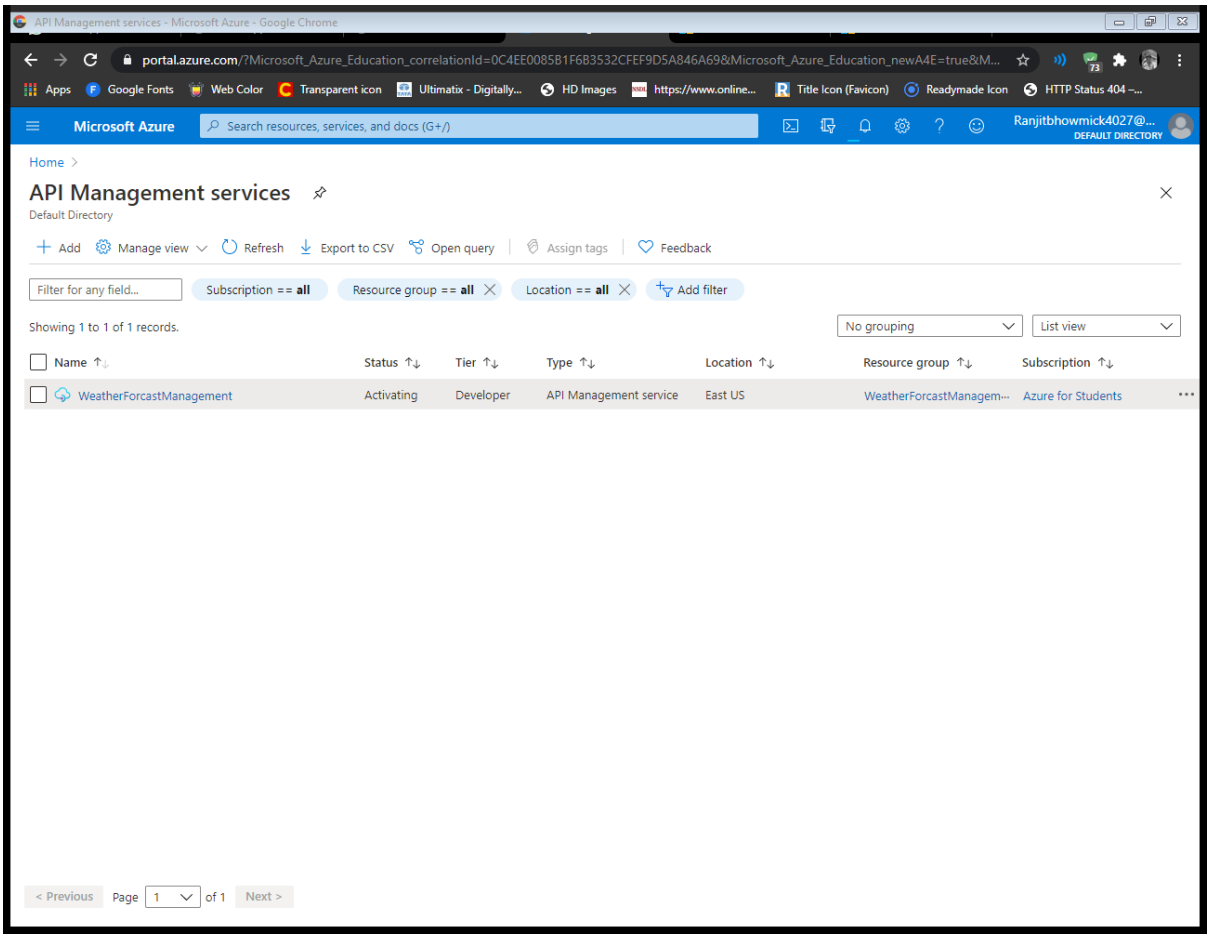


Now enable OAUTH 2.0 user Authorization –

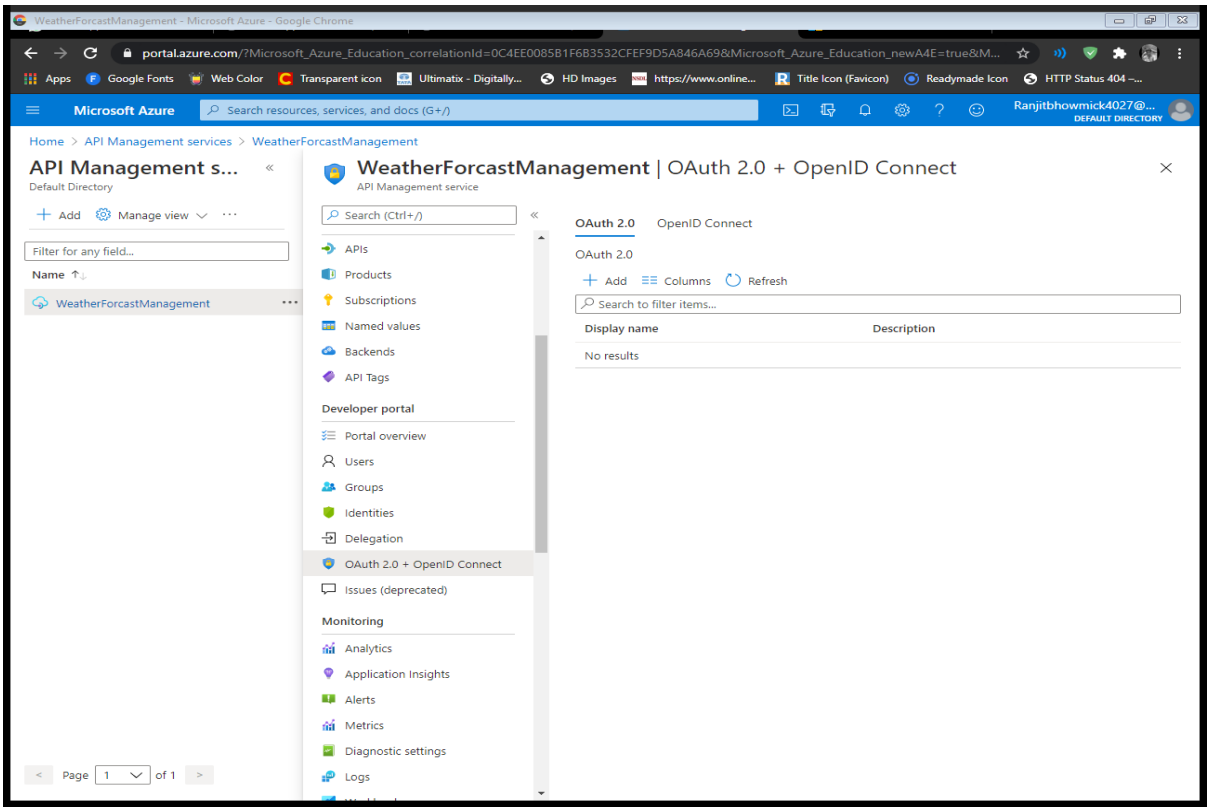
Navigate to Azure Homepage –



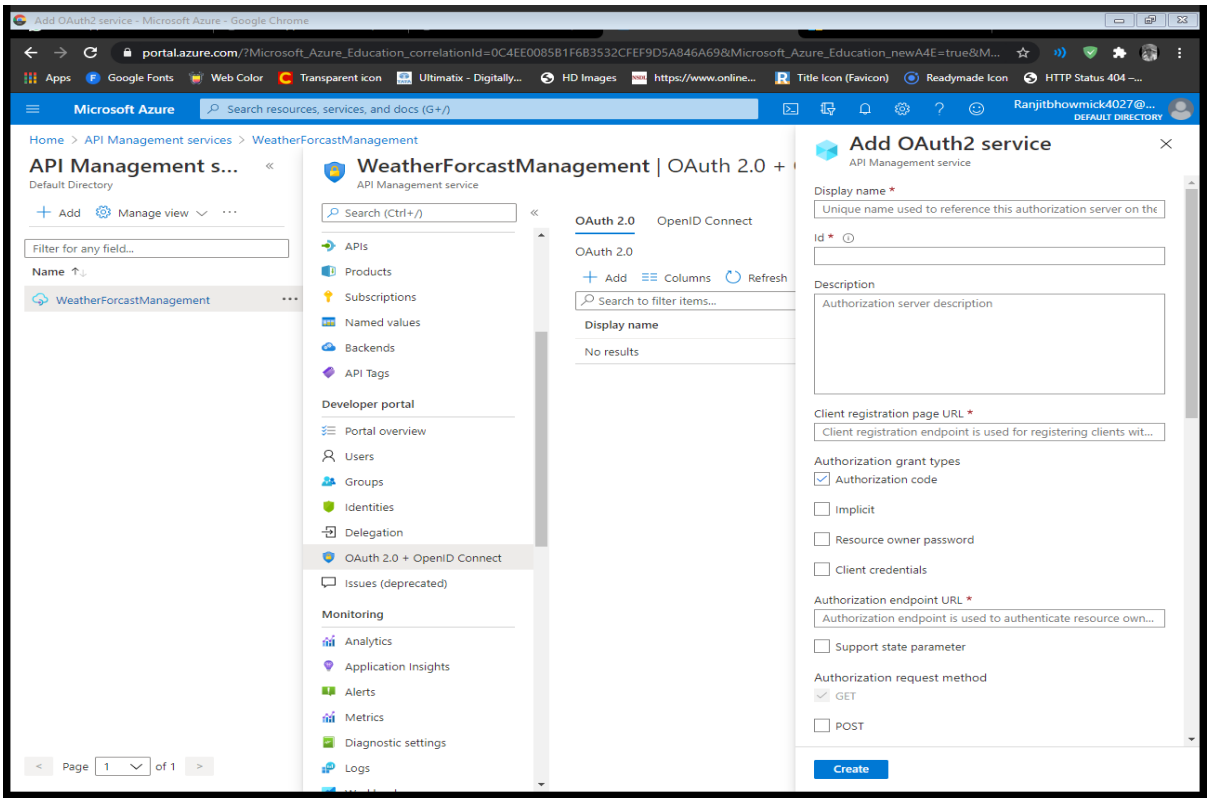
Search API Management Instance –



Select OAuth 2.0


WeatherForcastManagement - Microsoft Azure - Google Chrome
portal.azure.com/?Microsoft_Azure_Education_correlationId=0C4EE0085B1F6B3532CFEF9D5A846A69&Microsoft_Azure_Education_newA4E=true&M...
Microsoft Azure
Search resources, services, and docs (G+/)
Ranjitbhowmick4027@...
DEFAULT DIRECTORY
Home > API Management services > WeatherForcastManagement
API Management s...
Default Directory
Add
Manage view
Filter for any field...
Name
WeatherForcastManagement
Page 1 of 1
WeatherForcastManagement | OAuth 2.0 + OpenID Connect
API Management service
Search (Ctrl+/)
APIs
Products
Subscriptions
Named values
Backends
API Tags
Developer portal
Portal overview
Users
Groups
Identities
Delegation
OAuth 2.0 + OpenID Connect
Issues (deprecated)
Monitoring
Analytics
Application Insights
Alerts
Metrics
Diagnostic settings
Logs
OAuth 2.0
OpenID Connect
OAuth 2.0
Add
Columns
Refresh
Search to filter items...
Display name
Description
No results

Add OAuth 2.0 –


Add OAuth2 service - Microsoft Azure - Google Chrome
portal.azure.com/?Microsoft_Azure_Education_correlationId=0C4EE0085B1F6B3532CFEF9D5A846A69&Microsoft_Azure_Education_newA4E=true&M...
Microsoft Azure
Search resources, services, and docs (G+/)
Ranjitbhowmick4027@...
DEFAULT DIRECTORY
Home > API Management services > WeatherForcastManagement
API Management s...
Default Directory
Add
Manage view
Filter for any field...
Name
WeatherForcastManagement
Page 1 of 1
WeatherForcastManagement | OAuth 2.0 +
API Management service
Search (Ctrl+/)
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Subscriptions
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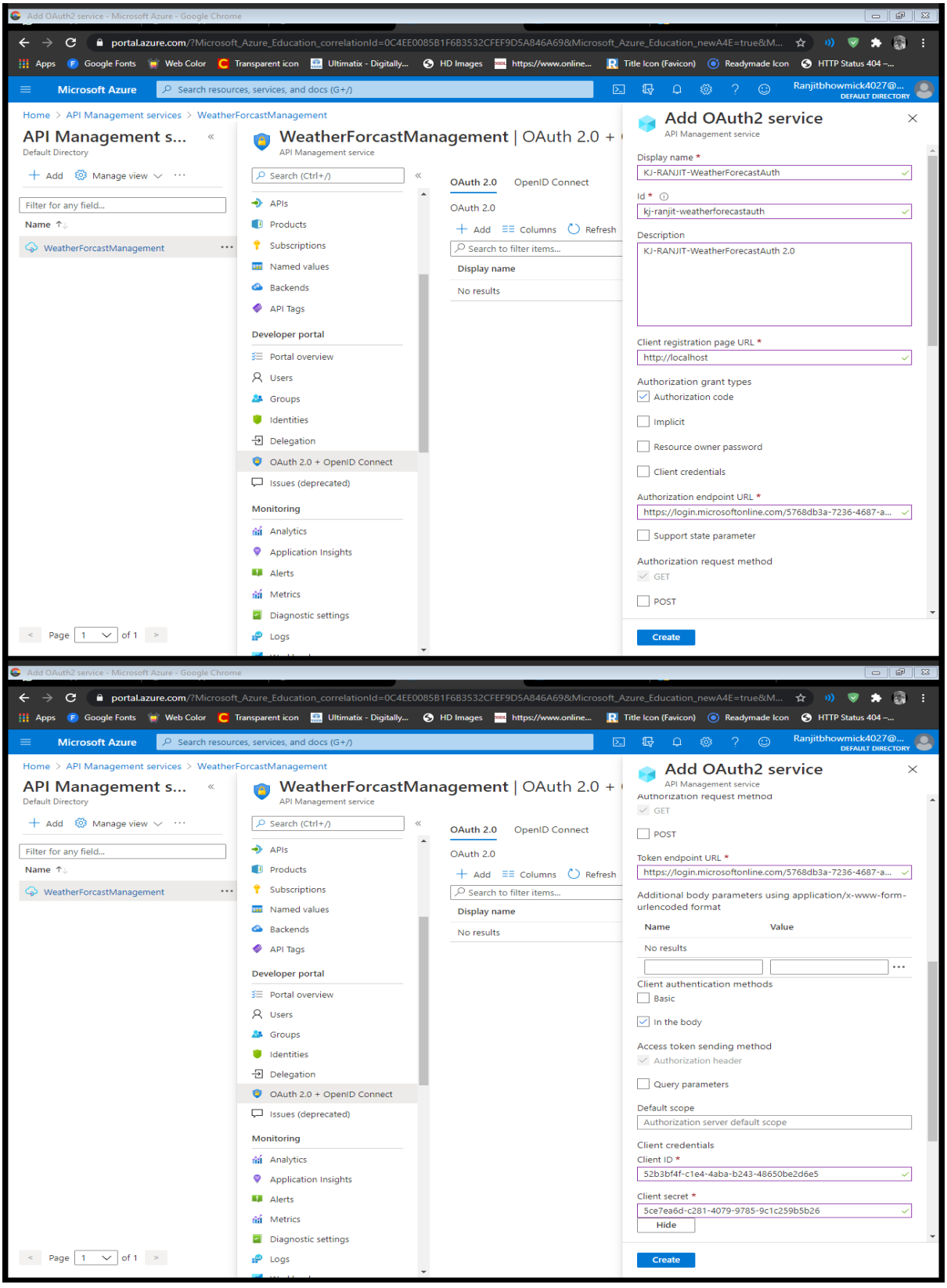
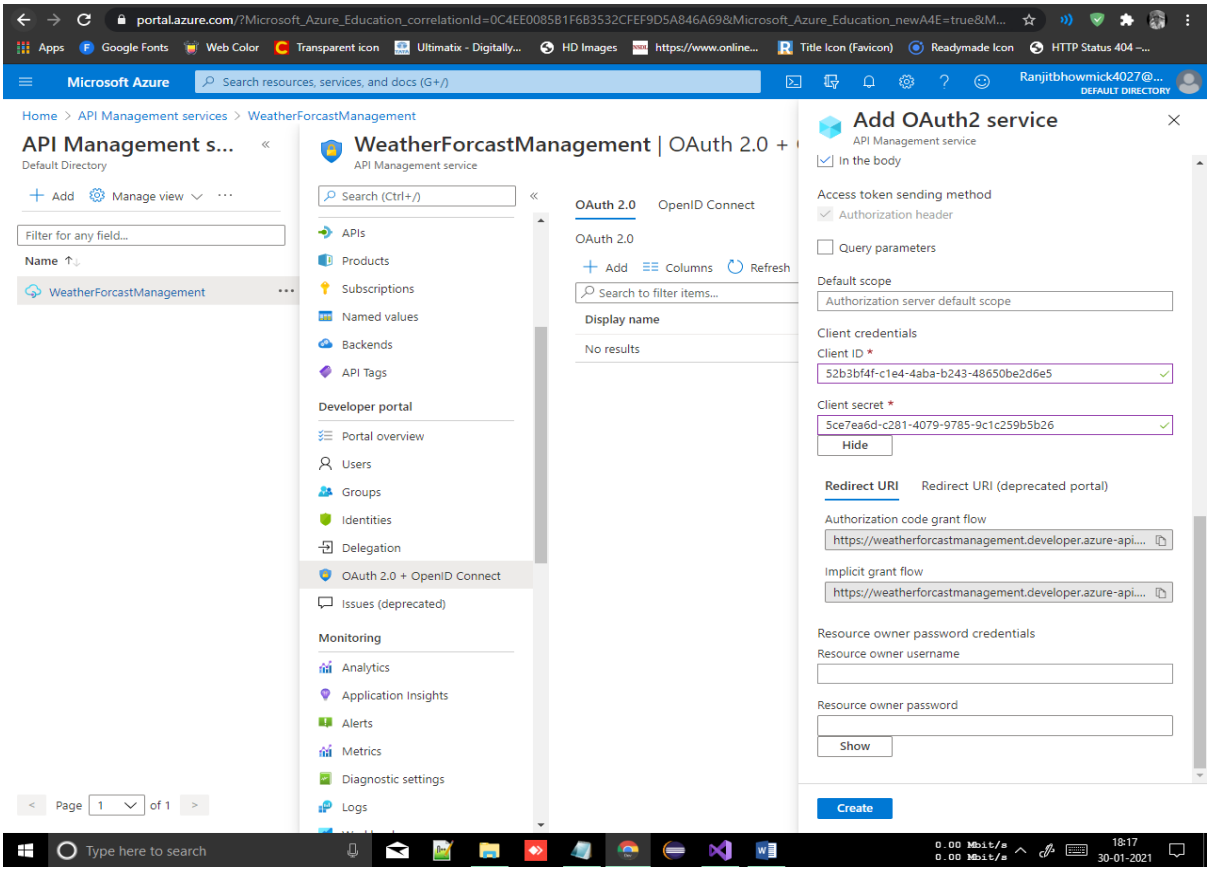
Issues (deprecated)
Monitoring
Analytics
Application Insights
Alerts
Metrics
Diagnostic settings
Logs
OAuth 2.0
OpenID Connect
OAuth 2.0
Add
Columns
Refresh
Search to filter items...
Display name
No results
Add OAuth2 service
API Management service
Display name *
Unique name used to reference this authorization server on the
Id *
Description
Authorization server description
Client registration page URL *
Client registration endpoint is used for registering clients wit...
Authorization grant types
Authorization code
Implicit
Resource owner password
Client credentials
Authorization endpoint URL *
Authorization endpoint is used to authenticate resource own...
Support state parameter
Authorization request method
GET
POST
Create

Enter all details as below –




Microsoft Azure
Search resources, services, and docs (G+/)
Home > API Management services > WeatherForcastManagement
API Management s...
Default Directory
Add
Manage view
Filter for any field...
Name
WeatherForcastManagement
WeatherForcastManagement | OAuth 2.0 +
API Management service
Search (Ctrl+/)
APIs
Products
Subscriptions
Named values
Backends
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Developer portal
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Users
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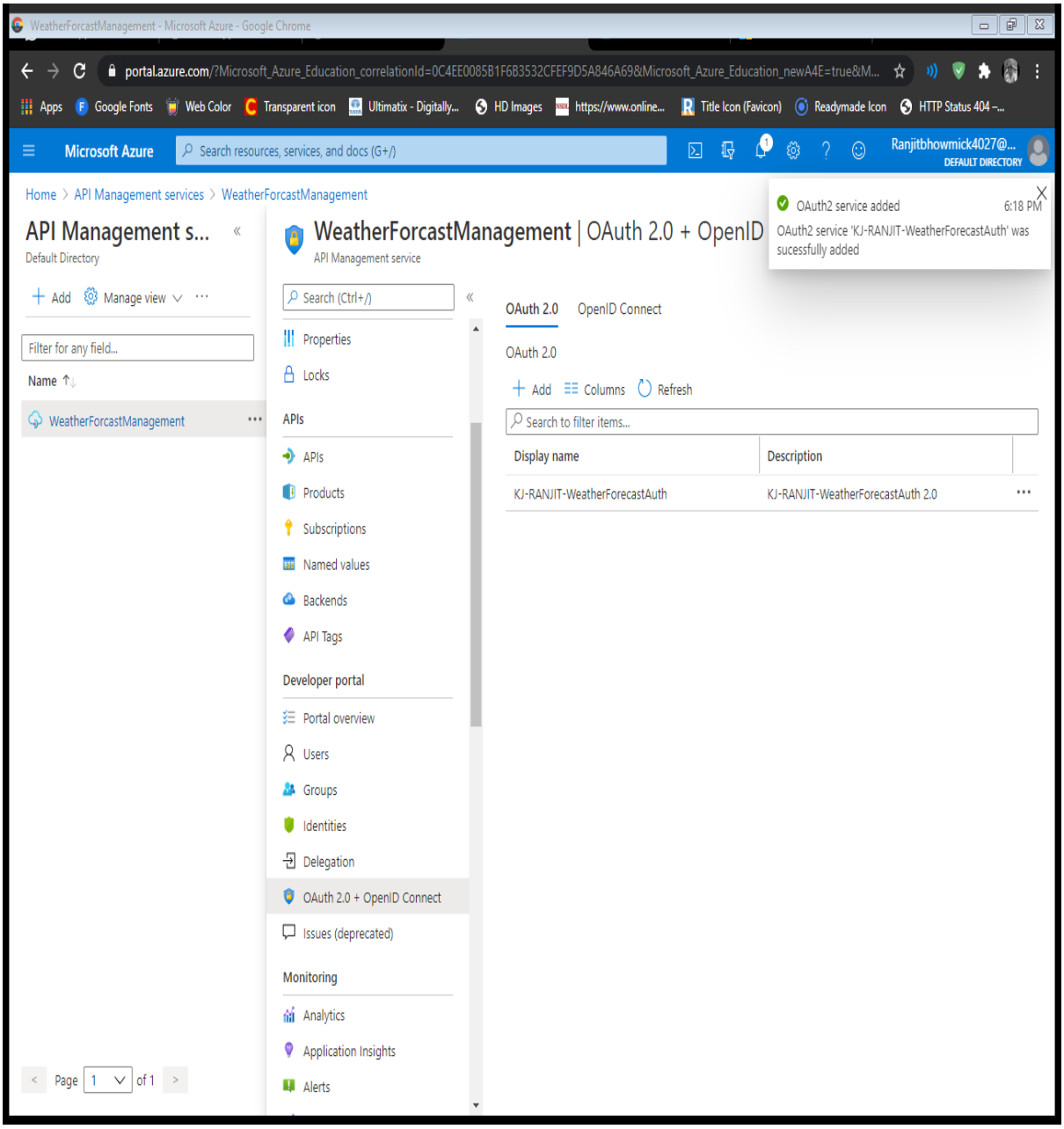
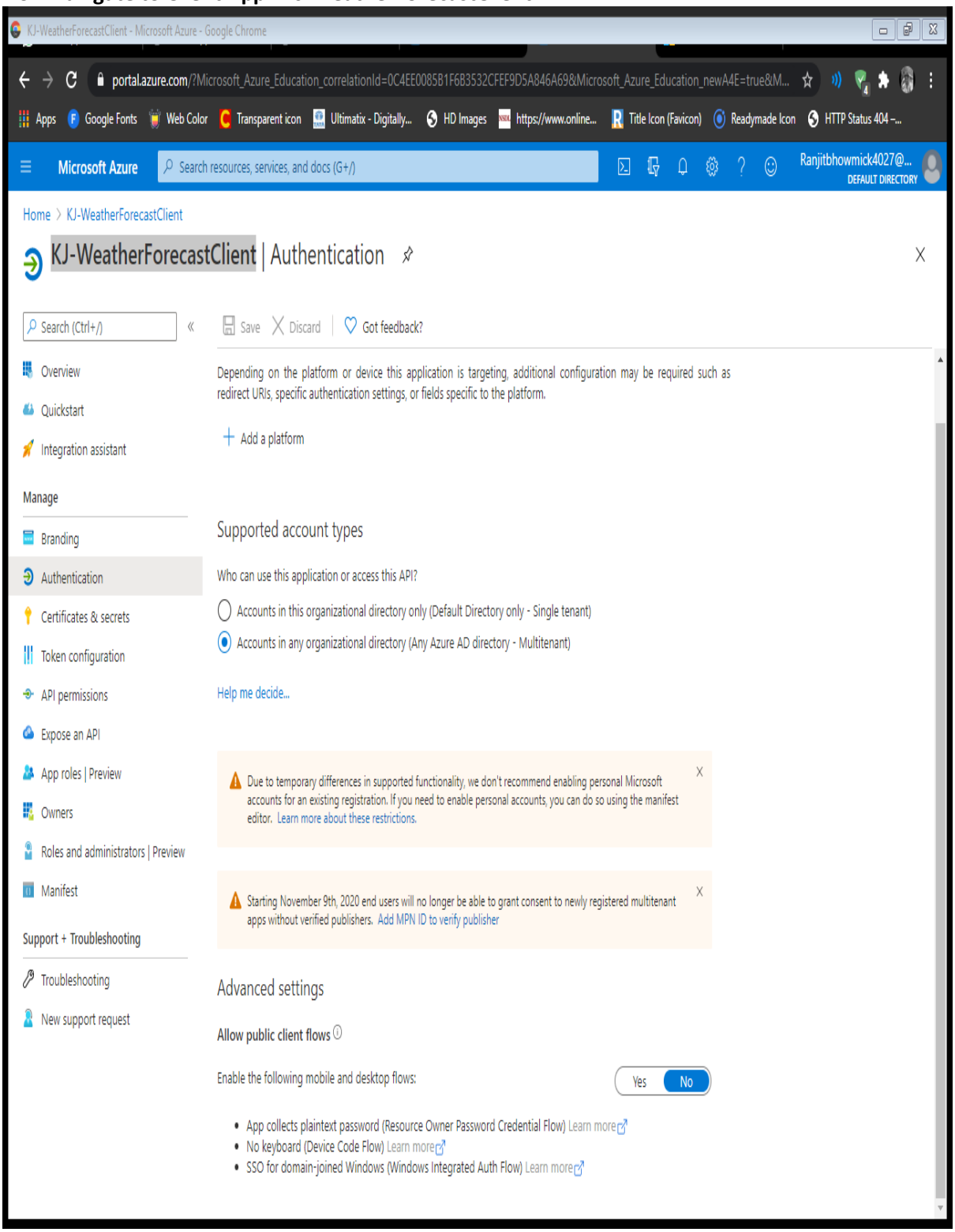
Delegation
OAuth 2.0 + OpenID Connect
Issues (deprecated)
Monitoring
Analytics
Application Insights
Alerts
Metrics
Diagnostic settings
Logs
OAuth 2.0
OpenID Connect
OAuth 2.0
Add
Columns
Refresh
Search to filter items...
Display name
No results
Add OAuth2 service
API Management service
In the body
Access token sending method
Authorization header
Query parameters
Default scope
Authorization server default scope
Client credentials
Client ID *
52b3bf4f-c1e4-4aba-b243-48650be2d6e5
Client secret *
5ce7ea6d-c281-4079-9785-9c1c259b5b26
Hide
Redirect URI
Redirect URI (deprecated portal)
Authorization code grant flow
https://weatherforcastmanagement.developer.azure-api....
Implicit grant flow
https://weatherforcastmanagement.developer.azure-api....
Resource owner password credentials
Resource owner username
Resource owner password
Show
Create
Page 1 of 1
Type here to search
18:17
30-01-2021

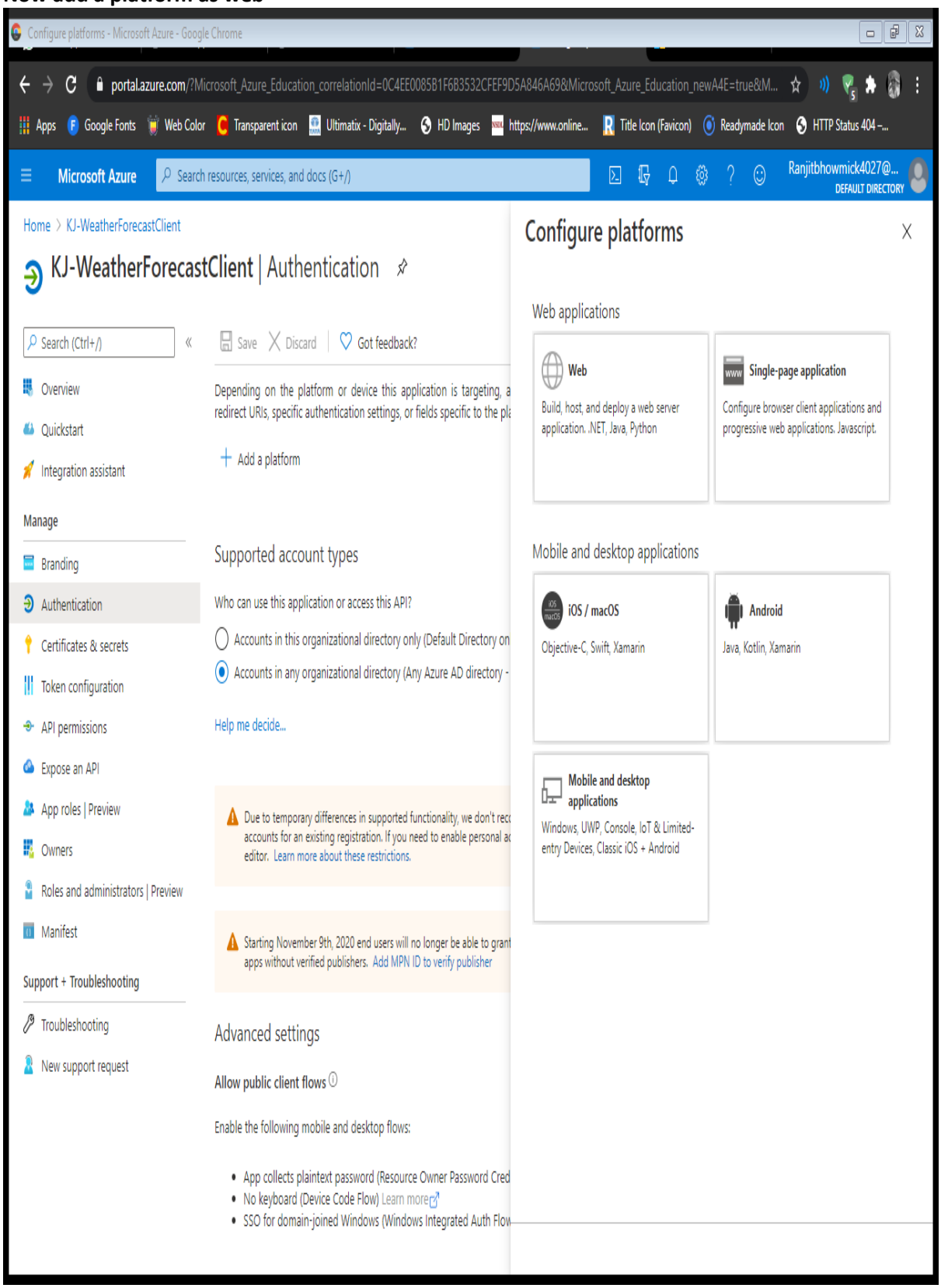
Click on create button –



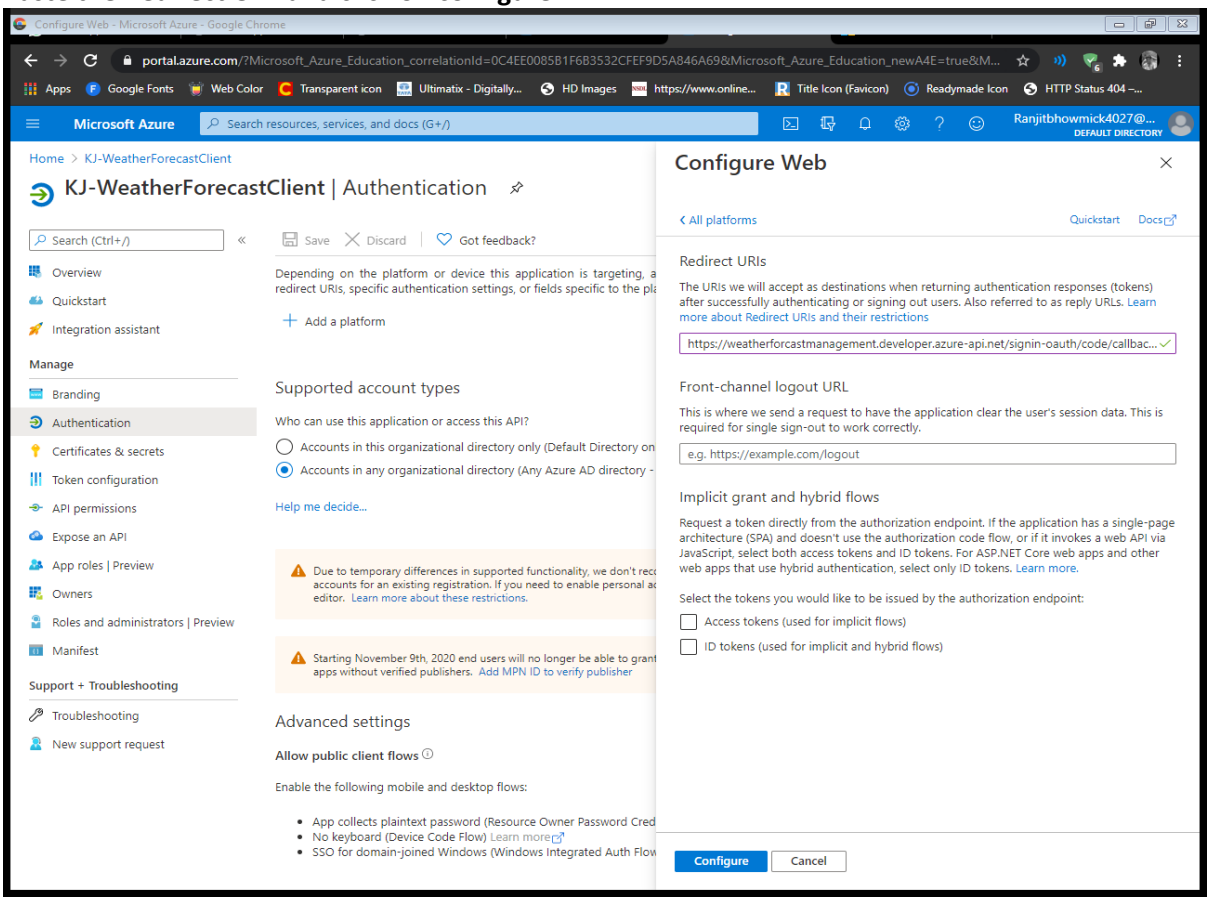
Now navigate to Client App - KJ-WeatherForecastClient-



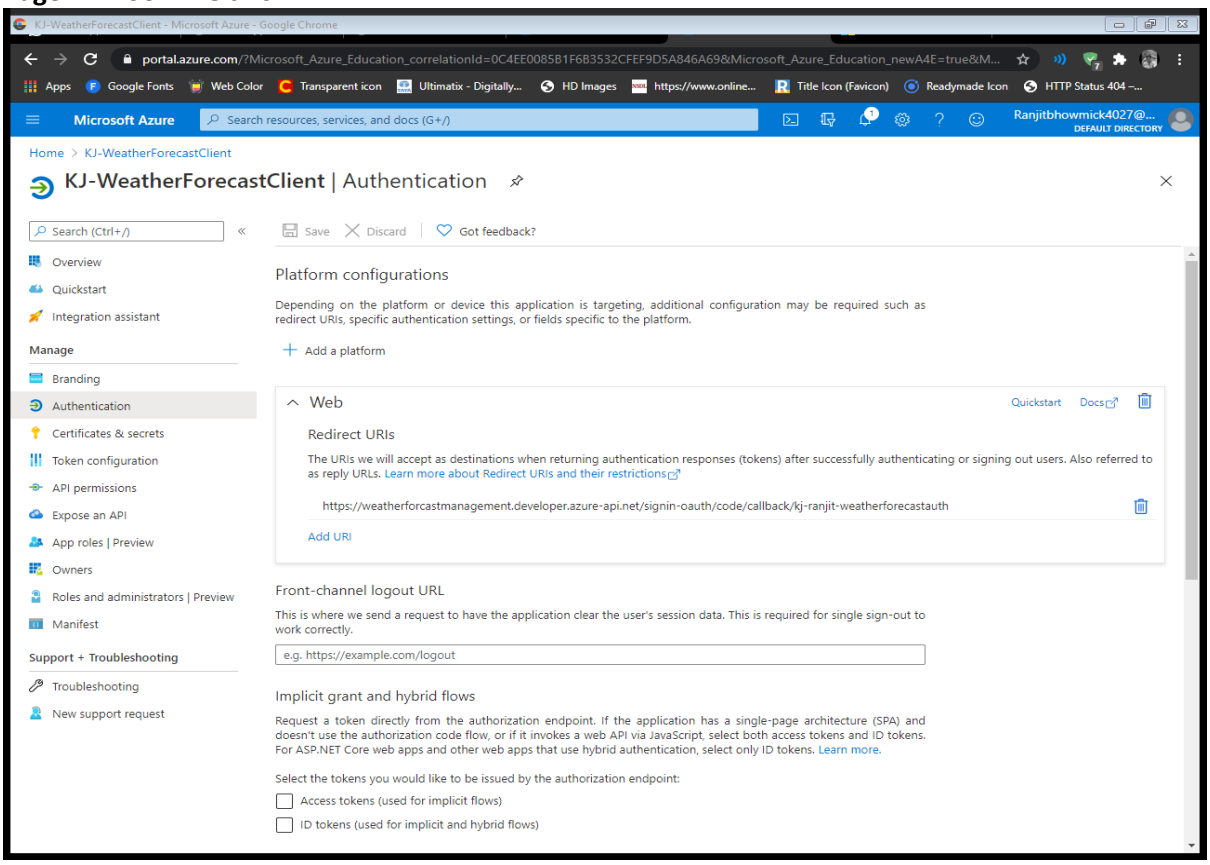
Now add a platform as web –



Paste the Redirect URL and click on configure-

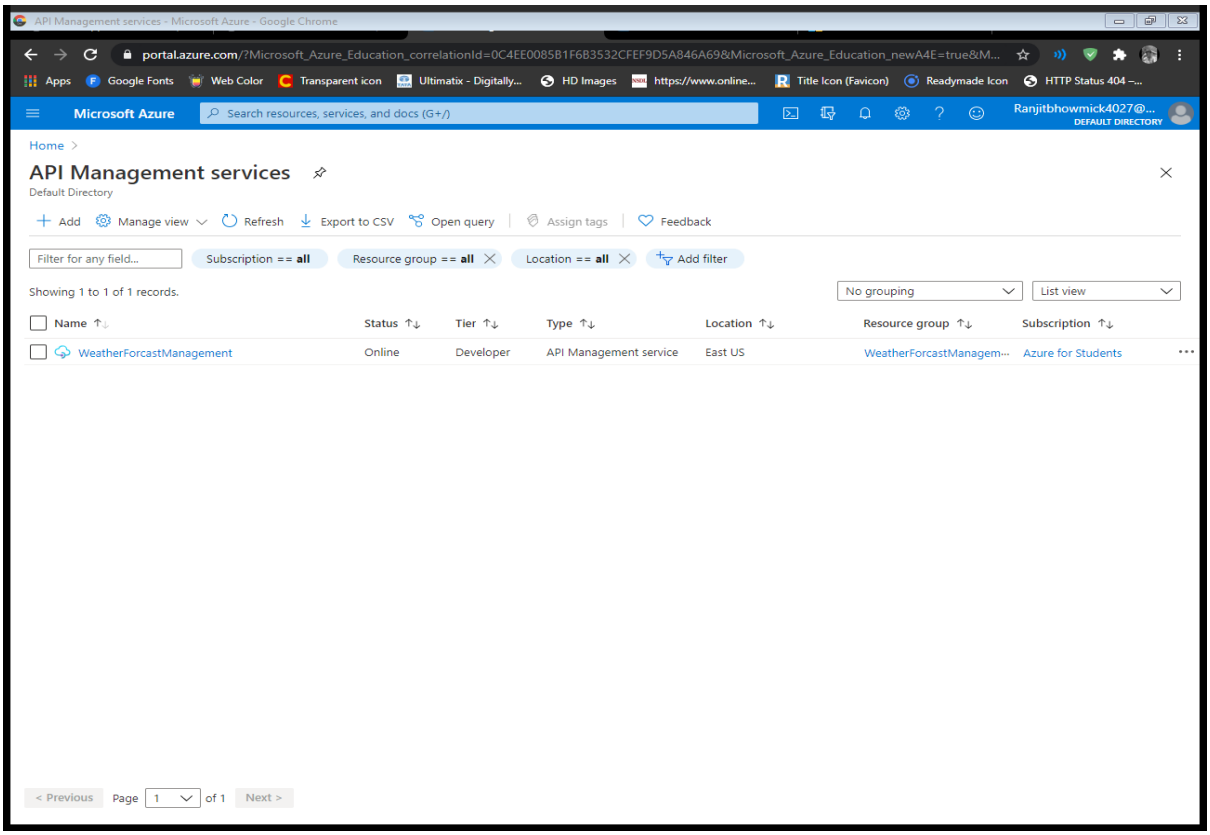


Page will look like this –

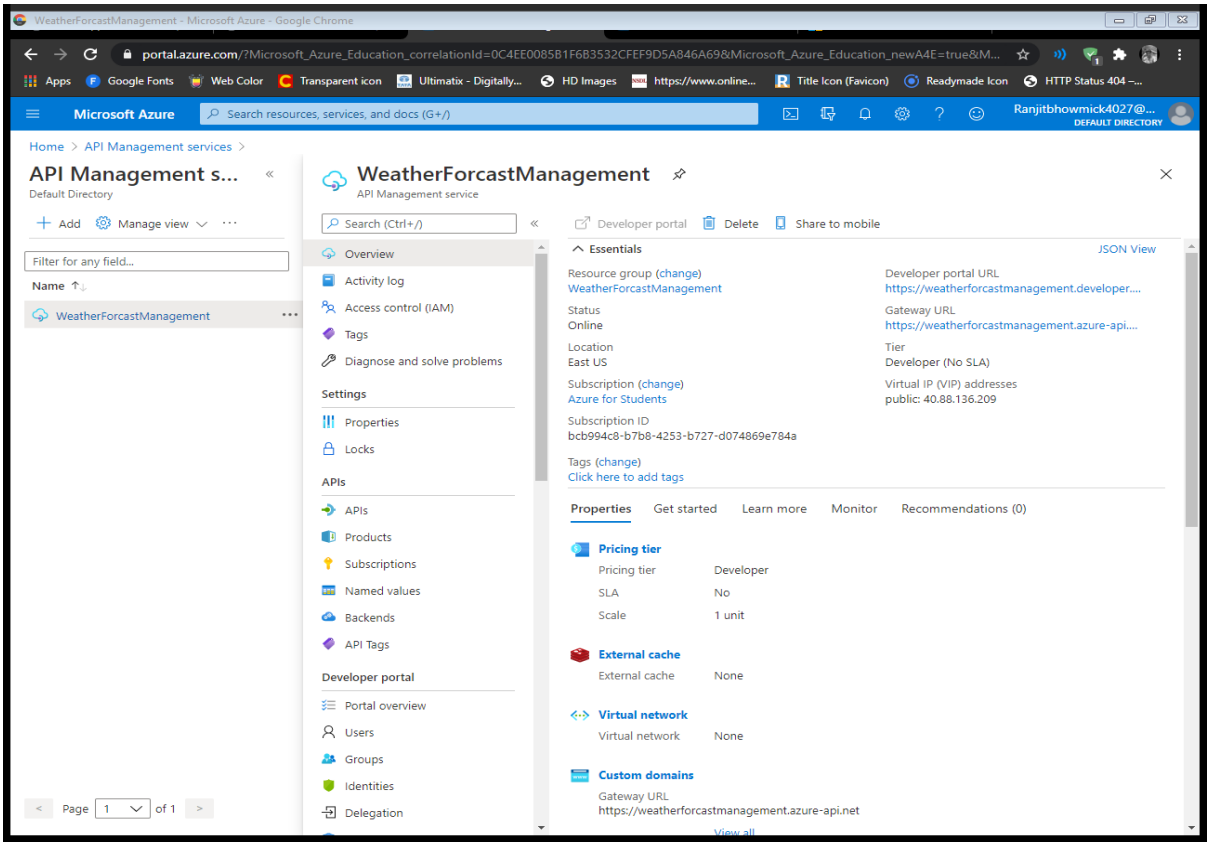


Now to enable OAuth 2.0 user authorization for your API –

Browser API Management service and select your service-


API Management services - Microsoft Azure - Google Chrome
portal.azure.com/?Microsoft_Azure_Education_correlationId=0C4EE0085B1F6B3532CFEF9D5A846A69&Microsoft_Azure_Education_newA4E=true&M...
Apps
Google Fonts
Web Color
Transparent icon
Ultimatix - Digitally...
HD Images
https://www.online...
Title Icon (Favicon)
Readymade Icon
HTTP Status 404 –...
Microsoft Azure
Search resources, services, and docs (G+/)
Ranjitbhowmick4027@...
DEFAULT DIRECTORY
Home
API Management services
Default Directory
Add
Manage view
Refresh
Export to CSV
Open query
Assign tags
Feedback
Filter for any field...
Subscription == all
Resource group == all
Location == all
Add filter
Showing 1 to 1 of 1 records.
No grouping
List view
Name
Status
Tier
Type
Location
Resource group
Subscription
WeatherForcastManagement
Online
Developer
API Management service
East US
WeatherForcastManagem...
Azure for Students
< Previous
Page
1
of 1
Next >

Select API


WeatherForcastManagement - Microsoft Azure - Google Chrome
portal.azure.com/?Microsoft_Azure_Education_correlationId=0C4EE0085B1F6B3532CFEF9D5A846A69&Microsoft_Azure_Education_newA4E=true&M...
Microsoft Azure
Search resources, services, and docs (G+/)
Ranjitbhowmick4027@...
DEFAULT DIRECTORY
Home
API Management services
API Management s...
Default Directory
Add
Manage view
Filter for any field...
Name
WeatherForcastManagement
Page
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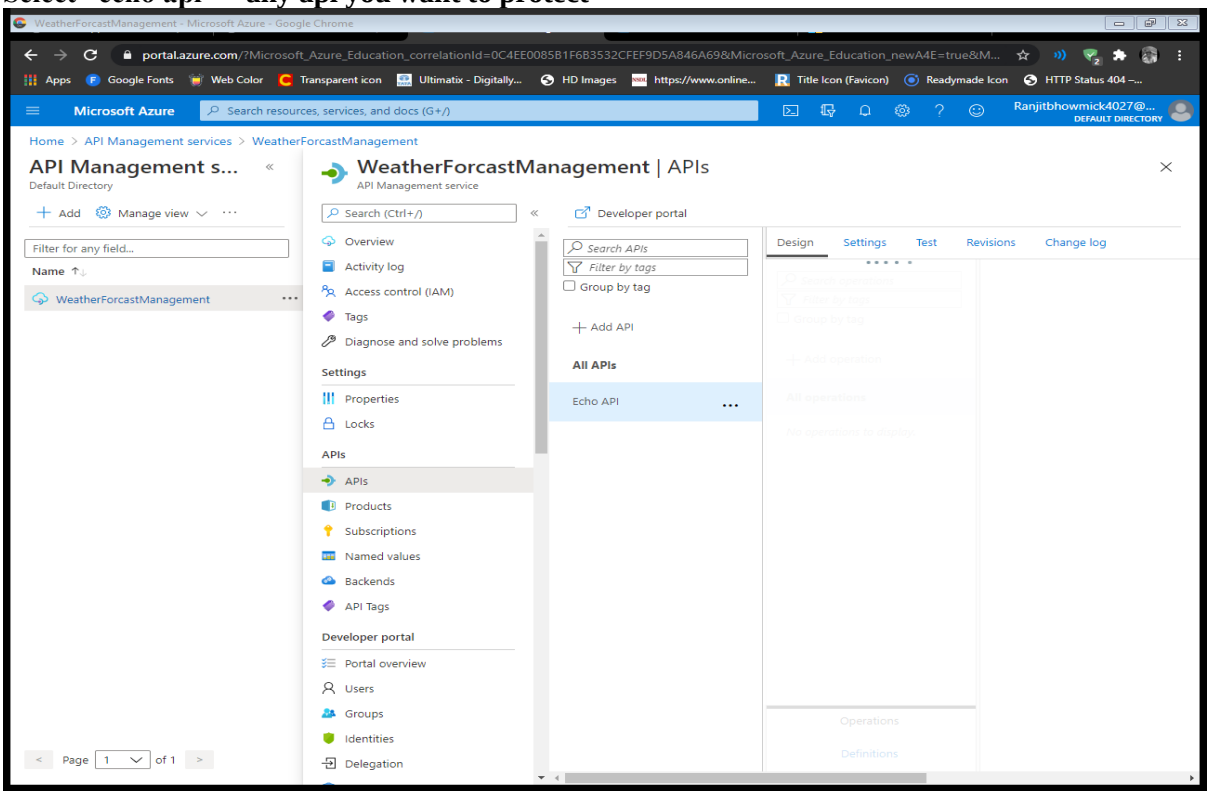
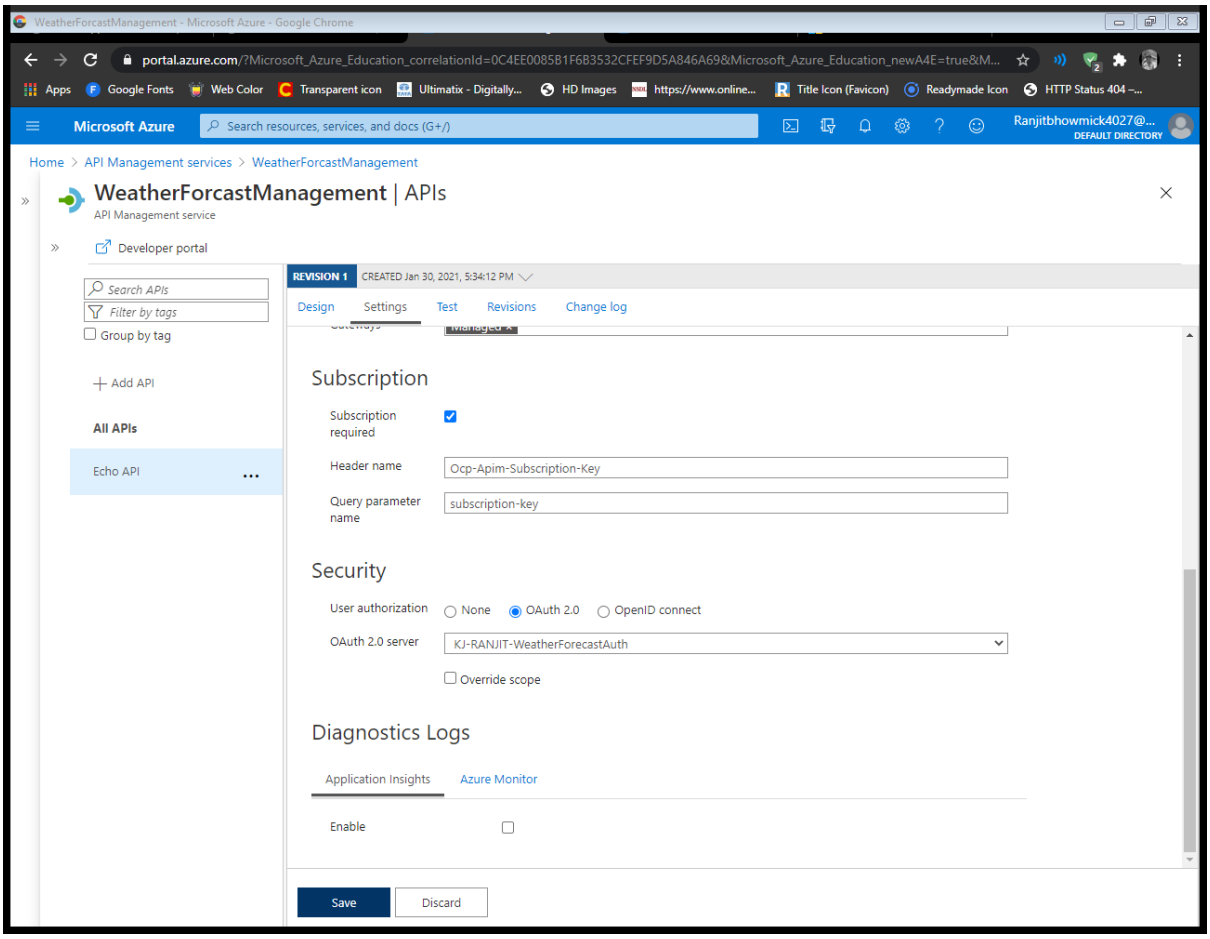
of 1
WeatherForcastManagement
API Management service
Search (Ctrl+/)
Overview
Activity log
Access control (IAM)
Tags
Diagnose and solve problems
Settings
Properties
Locks
APIs
APIs
Products
Subscriptions
Named values
Backends
API Tags
Developer portal
Portal overview
Users
Groups
Identities
Delegation
Developer portal
Delete
Share to mobile
Essentials
JSON View
Resource group (change)
WeatherForcastManagement
Status
Online
Location
East US
Subscription (change)
Azure for Students
Subscription ID
bcb994c8-b7b8-4253-b727-d074869e784a
Tags (change)
Click here to add tags
Developer portal URL
https://weatherforcastmanagement.developer....
Gateway URL
https://weatherforcastmanagement.azure-api....
Tier
Developer (No SLA)
Virtual IP (VIP) addresses
public: 40.88.136.209
Properties
Get started
Learn more
Monitor
Recommendations (0)
Pricing tier
Pricing tier
Developer
SLA
No
Scale
1 unit
External cache
External cache
None
Virtual network
Virtual network
None
Custom domains
Gateway URL
https://weatherforcastmanagement.azure-api.net
View all

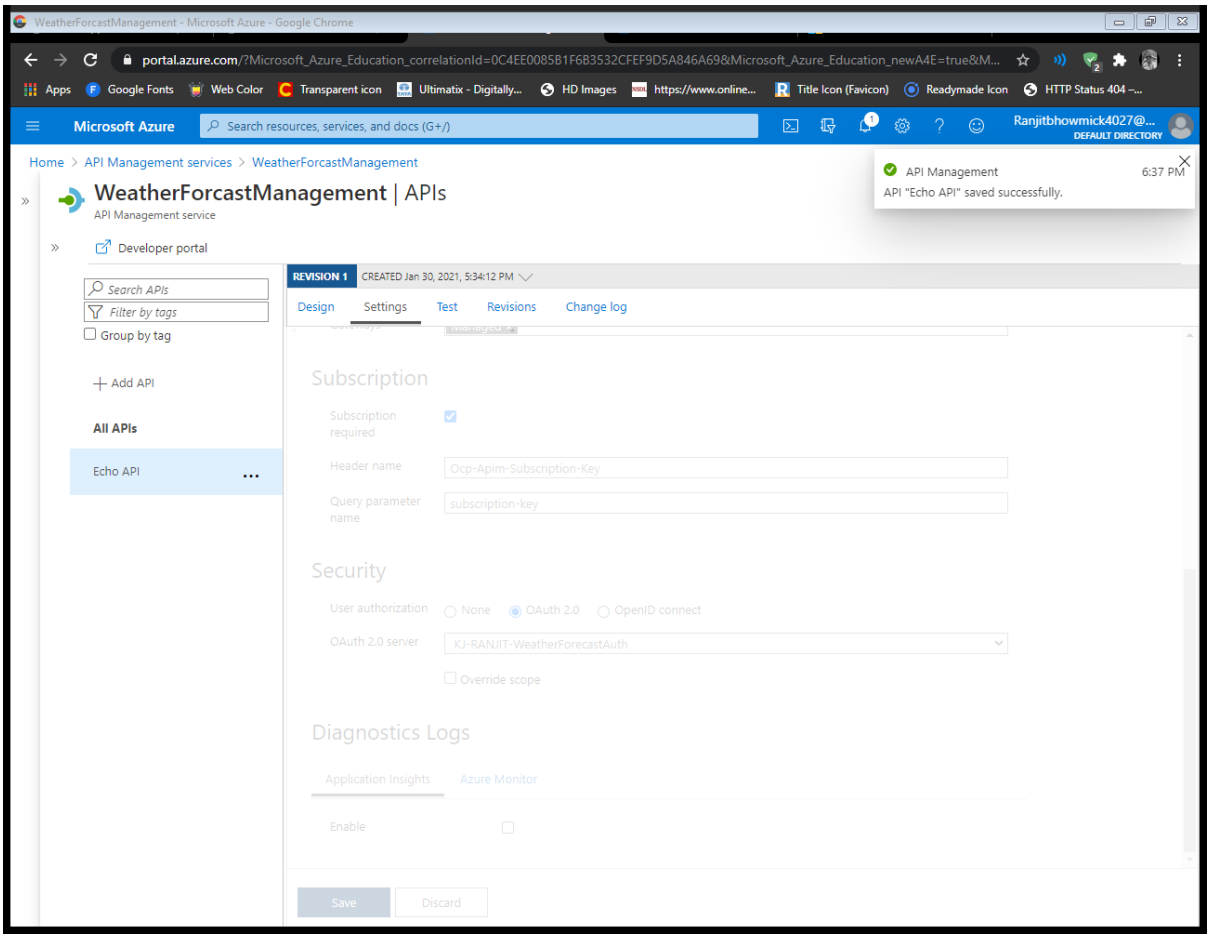
Select “echo api” – any api you want to protect –



Now move to setting and Select OAUTH 2.0 which have been configured –

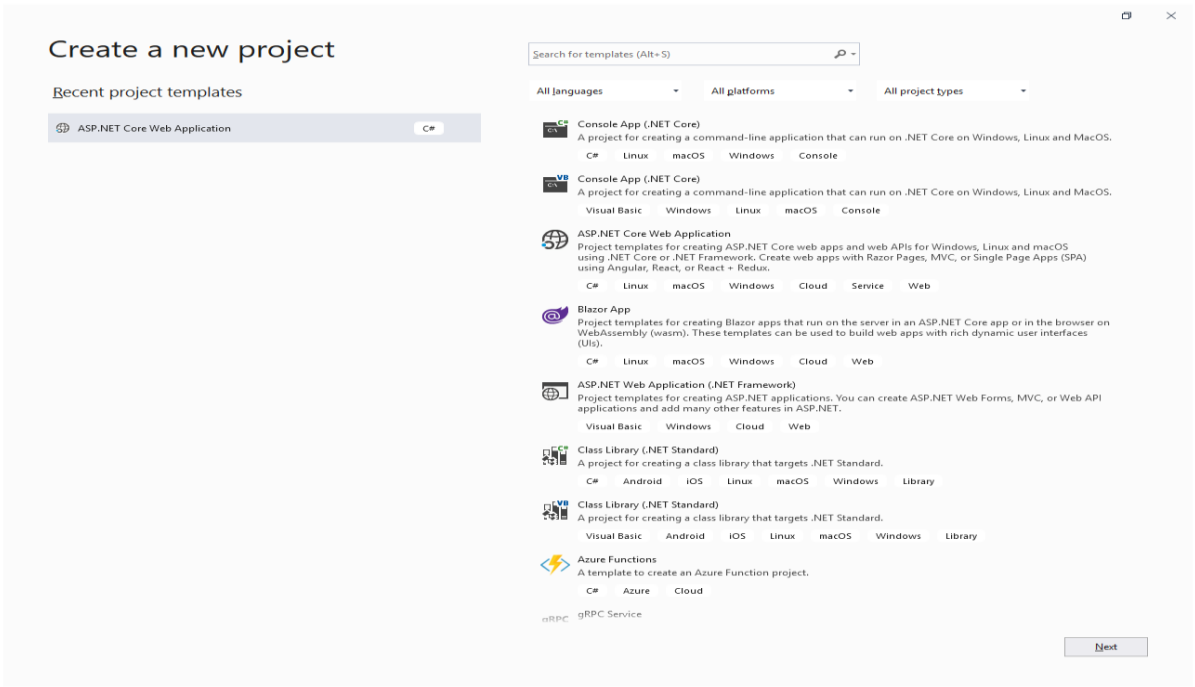


Now click on Save-

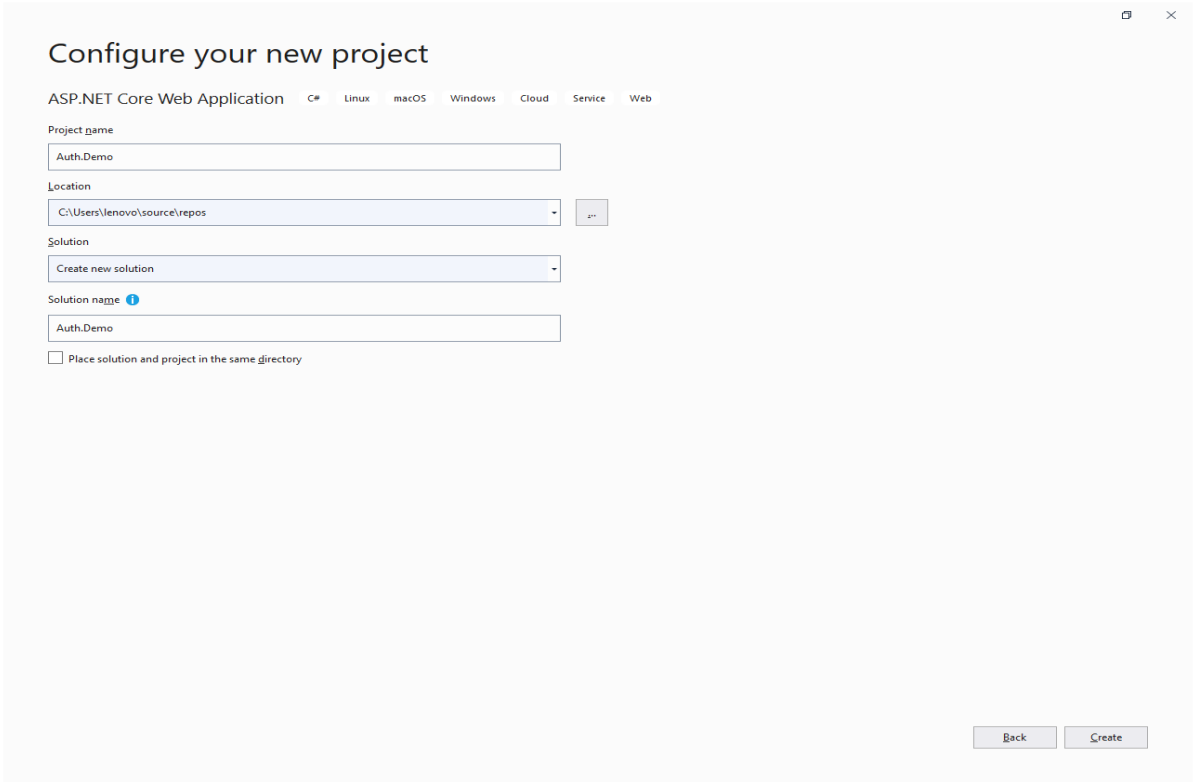

WeatherForcastManagement - Microsoft Azure - Google Chrome
portal.azure.com/?Microsoft_Azure_Education_correlationId=0C4EE0085B1F6B3532CFEF9D5A846A69&Microsoft_Azure_Education_newA4E=true&M...
Apps
Google Fonts
Web Color
Transparent icon
Ultimatix - Digitally...
HD Images
https://www.online...
Title Icon (Favicon)
Readymade Icon
HTTP Status 404 –...
Microsoft Azure
Search resources, services, and docs (G+/)
Ranjitbhowmick4027@...
DEFAULT DIRECTORY
Home > API Management services > WeatherForcastManagement
API Management
6:37 PM
API "Echo API" saved successfully.
WeatherForcastManagement | APIs
API Management service
Developer portal
Search APIs
Filter by tags
Group by tag
Add API
All APIs
Echo API
REVISION 1
CREATED Jan 30, 2021, 5:34:12 PM
Design
Settings
Test
Revisions
Change log
Subscription
Subscription required
Header name
Ocp-Apim-Subscription-Key
Query parameter name
subscription-key
Security
User authorization
None
OAuth 2.0
OpenID connect
OAuth 2.0 server
KJ-RANJIT-WeatherForecastAuth
Override scope
Diagnostics Logs
Application Insights
Azure Monitor
Enable
Save
Discard

Issuing a custom JWT token using a symmetric signing key

Create new Asp.Net Core Project –



Enter Details and Select API Option –

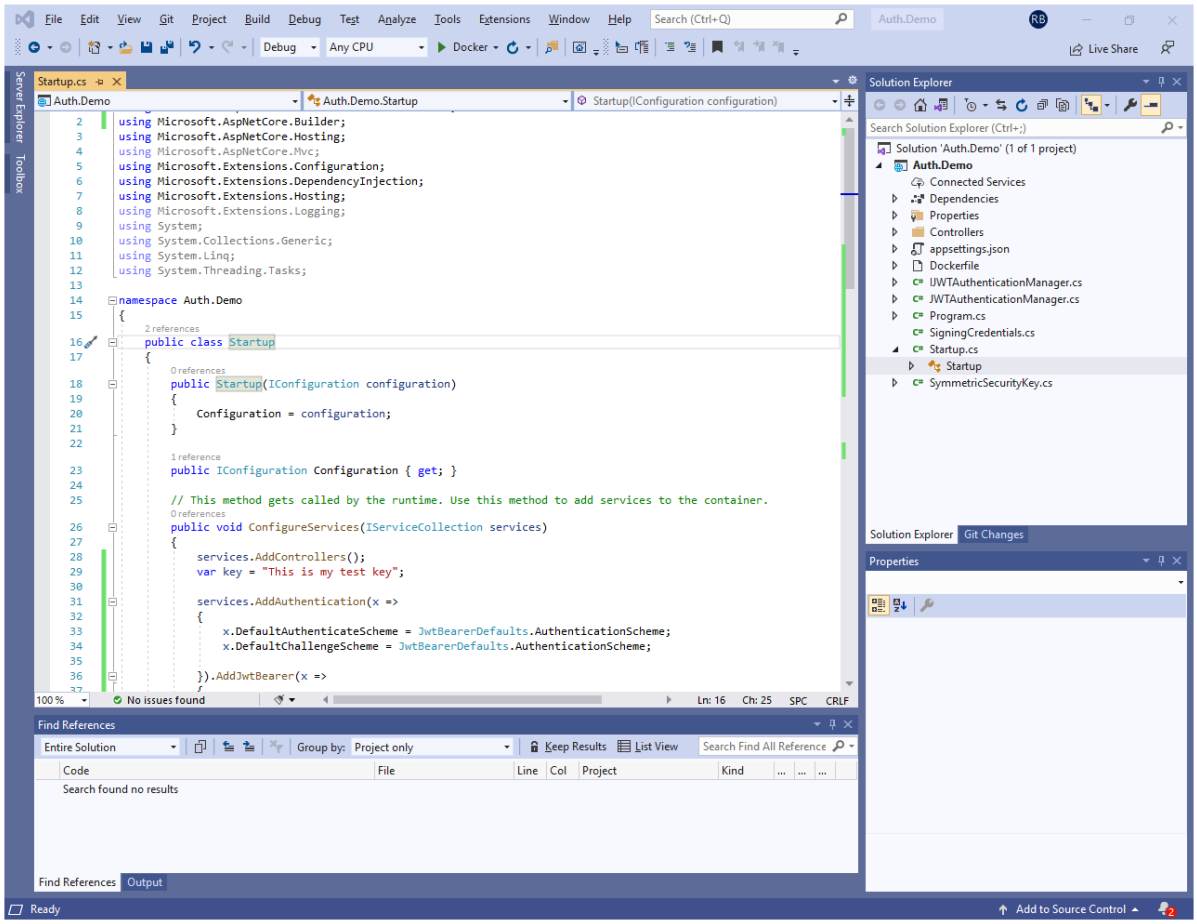


Follow below steps –

Create Startup.cs and use below Code –

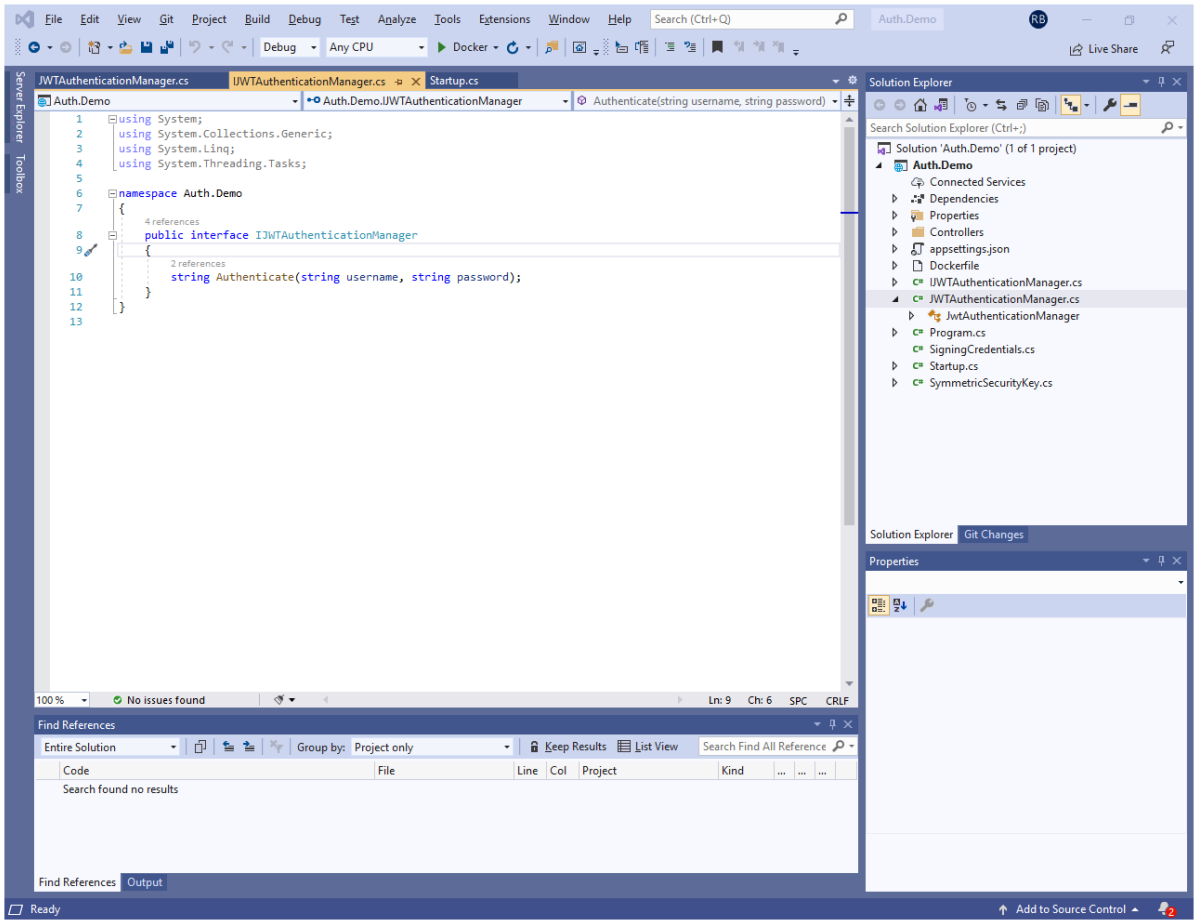
```
using Microsoft.AspNetCore.Authentication.JwtBearer;
using Microsoft.AspNetCore.Builder;
using Microsoft.AspNetCore.Hosting;
using Microsoft.AspNetCore.Mvc;
using Microsoft.Extensions.Configuration;
using Microsoft.Extensions.DependencyInjection;
using Microsoft.Extensions.Hosting;
using Microsoft.Extensions.Logging;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;

namespace Auth.Demo
{
    public class Startup
    {
        public Startup(IConfiguration configuration)
        {
            Configuration = configuration;
        }

        public IConfiguration Configuration { get; }

        // This method gets called by the runtime. Use this method to add services to the
container.
        public void ConfigureServices(IServiceCollection services)
        {
            services.AddControllers();
            var key = "This is my test key";

            services.AddAuthentication(x =>
            {
                x.DefaultAuthenticateScheme = JwtBearerDefaults.AuthenticationScheme;
                x.DefaultChallengeScheme = JwtBearerDefaults.AuthenticationScheme;

            }).AddJwtBearer(x =>
            {
                x.RequireHttpsMetadata = false;
                x.SaveToken = true;
                x.TokenValidationParameters = new
Microsoft.IdentityModel.Tokens.TokenValidationParameters
                {
                    ValidateIssuerSigningKey = true,
                    IssuerSigningKey = new
SymmetricSecurityKey(System.Text.Encoding.ASCII.GetBytes(key)),
                    ValidateIssuer = false,
                    ValidateAudience = false



                };
```

```
            });

            services.AddSingleton<IJWTAuthenticationManager>(new
JwtAuthenticationManager(key));



        }

        // This method gets called by the runtime. Use this method to configure the HTTP
request pipeline.
        public void Configure(IApplicationBuilder app, IWebHostEnvironment env)
        {
            if (env.IsDevelopment())
            {
                app.UseDeveloperExceptionPage();
            }

            app.UseRouting();

            app.UseAuthentication();

            app.UseAuthorization();

            app.UseEndpoints(endpoints =>
            {
                endpoints.MapControllers();
            });
        }
    }
}
```



Create Interface - IJWTAuthenticationManager.cs

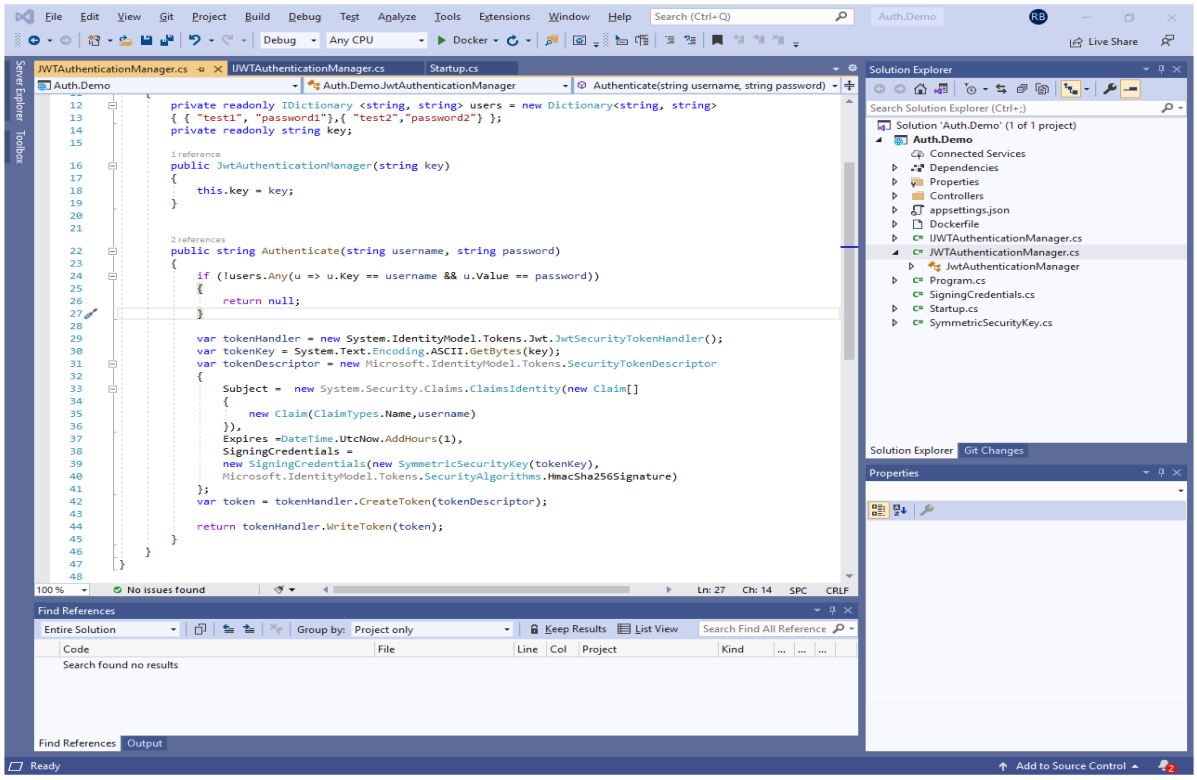
```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;

namespace Auth.Demo
{
    public interface IJWTAuthenticationManager
    {
        string Authenticate(string username, string password);
    }
}
```



Create class - JWTAuthenticationManager.cs

```
using Microsoft.IdentityModel.Tokens;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Security.Claims;
using System.Threading.Tasks;

namespace Auth.Demo
{
    public class JwtAuthenticationManager : IJWTAuthenticationManager
    {
        private readonly IDictionary <string, string> users = new Dictionary<string,
string>
        { { "test1", "password1"},{ "test2","password2"} };
        private readonly string key;

        public JwtAuthenticationManager(string key)
        {
            this.key = key;
        }


        public string Authenticate(string username, string password)
        {
            if (!users.Any(u => u.Key == username && u.Value == password))
```

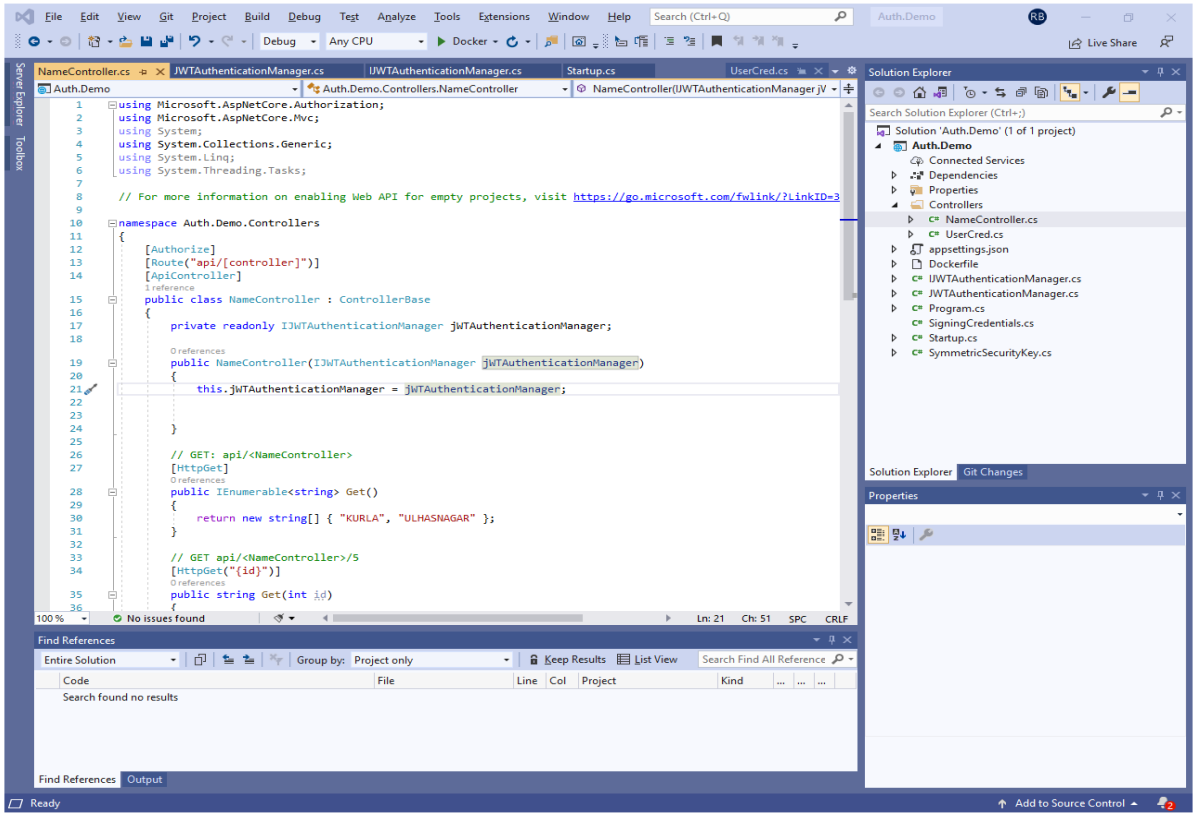
```
            {
                return null;
            }

            var tokenHandler = new
System.IdentityModel.Tokens.Jwt.JwtSecurityTokenHandler();
            var tokenKey = System.Text.Encoding.ASCII.GetBytes(key);
            var tokenDescriptor = new
Microsoft.IdentityModel.Tokens.SecurityTokenDescriptor
            {
                Subject =  new System.Security.Claims.ClaimsIdentity(new Claim[]
                {
                    new Claim(ClaimTypes.Name,username)
                }),
                Expires =DateTime.UtcNow.AddHours(1),
                SigningCredentials =
                new SigningCredentials(new SymmetricSecurityKey(tokenKey),
                Microsoft.IdentityModel.Tokens.SecurityAlgorithms.HmacSha256Signature)
            };
            var token = tokenHandler.CreateToken(tokenDescriptor);

            return tokenHandler.WriteToken(token);
        }
    }
}
```



Create NameController.cs and follow below code –

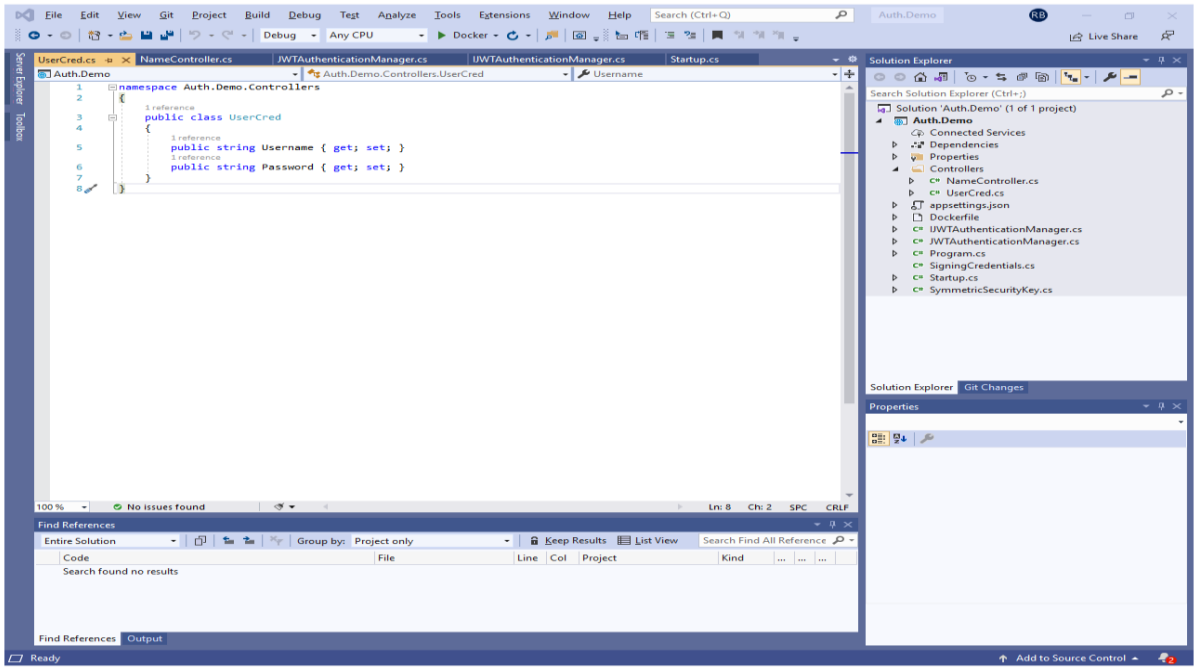
```
using Microsoft.AspNetCore.Authorization;
using Microsoft.AspNetCore.Mvc;
using System;
using System.Collections.Generic;
using System.Linq;
```

```
using System.Threading.Tasks;

// For more information on enabling Web API for empty projects, visit
https://go.microsoft.com/fwlink/?LinkID=397860

namespace Auth.Demo.Controllers
{
    [Authorize]
    [Route("api/[controller]")]
    [ApiController]
    public class NameController : ControllerBase
    {
        private readonly IJWTAuthenticationManager jWTAuthenticationManager;

        public NameController(IJWTAuthenticationManager jWTAuthenticationManager)
        {
            this.jWTAuthenticationManager = jWTAuthenticationManager;


        }

        // GET: api/<NameController>
        [HttpGet]
        public IEnumerable<string> Get()
        {
            return new string[] { "KURLA", "ULHASNAGAR" };
        }

        // GET api/<NameController>/5
        [HttpGet("{id}")]
        public string Get(int id)
        {
            return "value";
        }

        [AllowAnonymous]
        [HttpPost("authenticate")]
        public IActionResult Authenticate([FromBody] UserCred userCred)
        {
            var token = jWTAuthenticationManager.Authenticate(userCred.Username,
userCred.Password);
            if (token == null)
                return Unauthorized();

            return Ok(token);
        }
    }
}
```



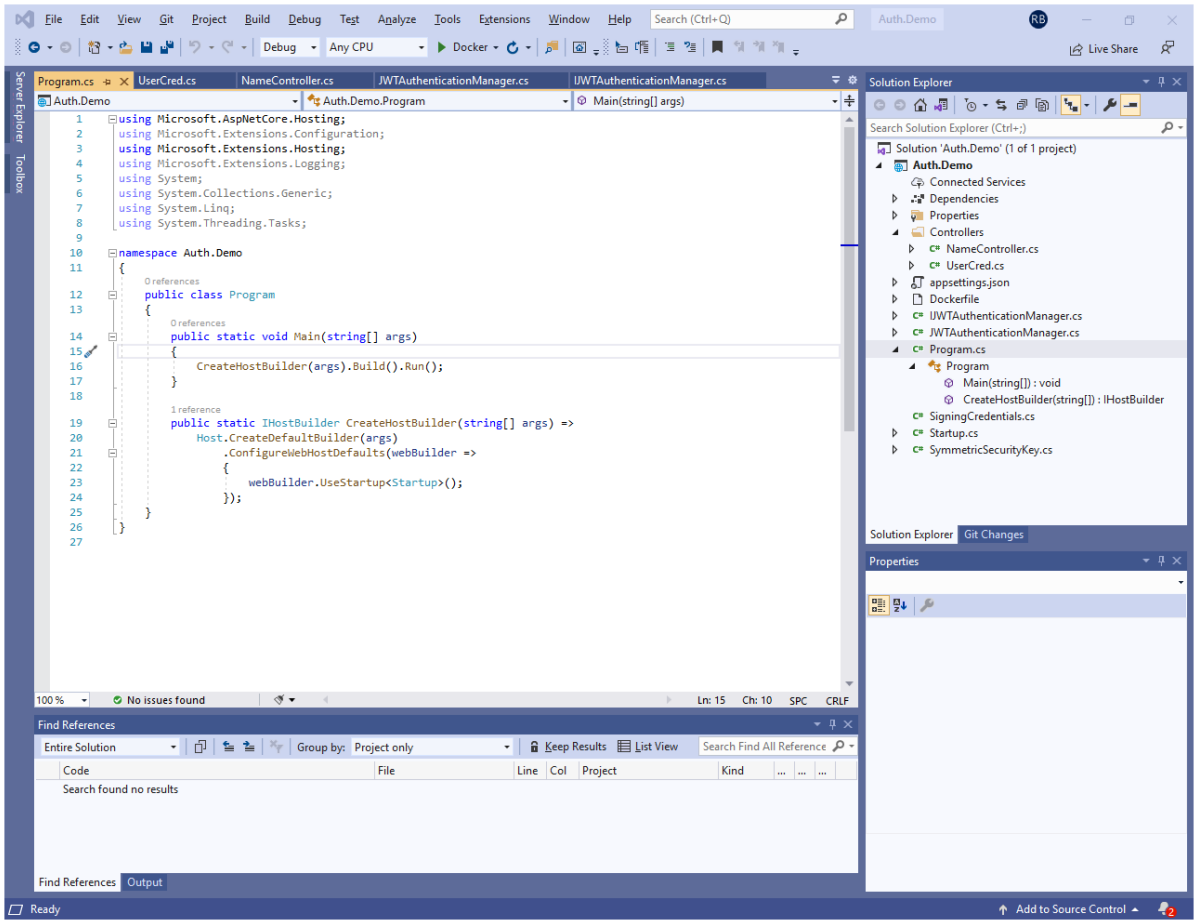
Create UserCred.cs and follow below code –

```
namespace Auth.Demo.Controllers
{
    public class UserCred
    {
        public string Username { get; set; }
        public string Password { get; set; }
    }
}
```

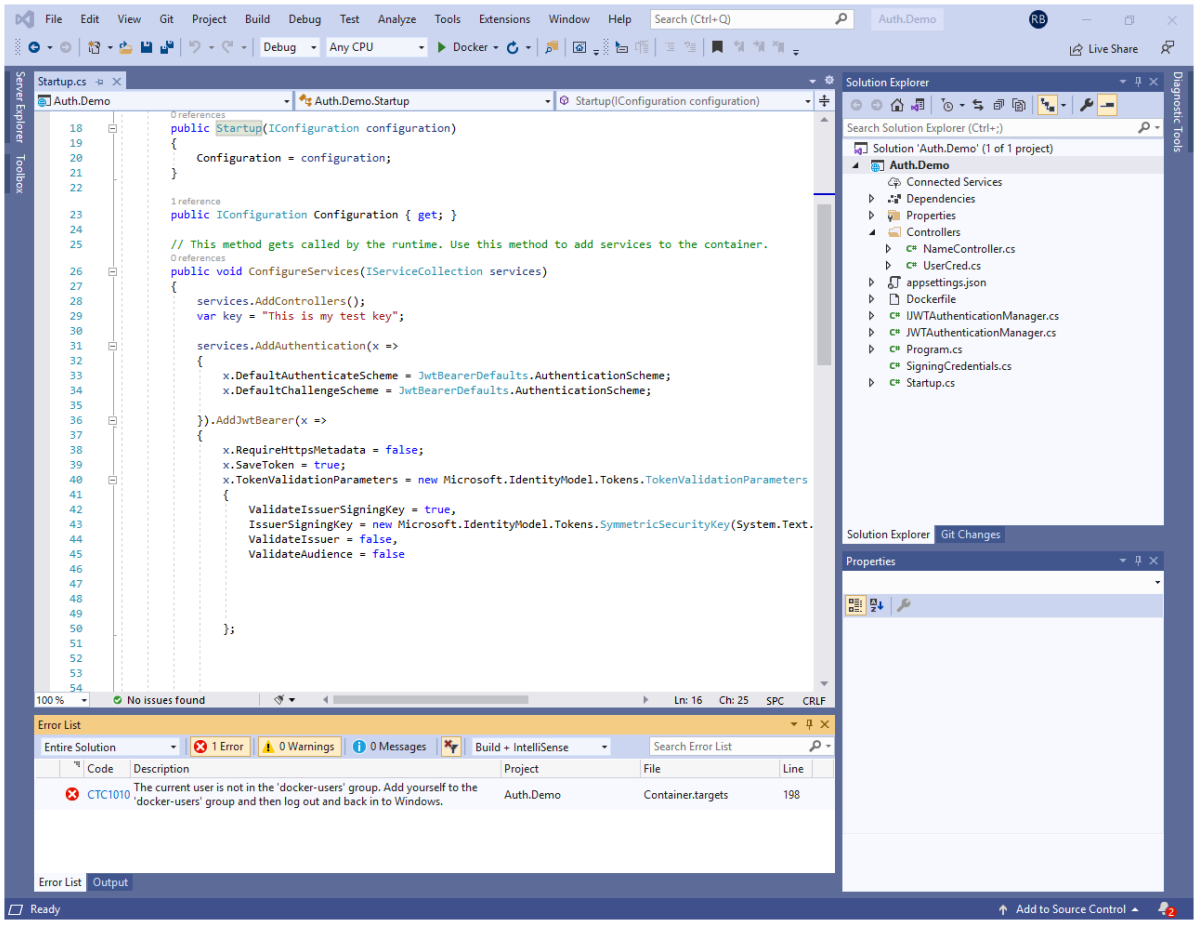


Keep Program.cs as it is-

```
using Microsoft.AspNetCore.Hosting;
using Microsoft.Extensions.Configuration;
using Microsoft.Extensions.Hosting;
using Microsoft.Extensions.Logging;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;

namespace Auth.Demo
{
    public class Program
    {
        public static void Main(string[] args)
        {
            CreateHostBuilder(args).Build().Run();
        }

        public static IHostBuilder CreateHostBuilder(string[] args) =>
            Host.CreateDefaultBuilder(args)
                .ConfigureWebHostDefaults(webBuilder =>
                {
                    webBuilder.UseStartup<Startup>();
                });
    }
}
```



In next step, getting error as below –


File Edit View Git Project Build Debug Test Analyze Tools Extensions Window Help
Search (Ctrl+Q)
Auth.Demo
Debug
Any CPU
Docker
Live Share
Startup.cs
Auth.Demo
Auth.Demo.Startup
Startup(IConfiguration configuration)
0 references
public Startup(IConfiguration configuration)
{
Configuration = configuration;
}
1 reference
public IConfiguration Configuration { get; }
// This method gets called by the runtime. Use this method to add services to the container.
0 references
public void ConfigureServices(IServiceCollection services)
{
services.AddControllers();
var key = "This is my test key";
services.AddAuthentication(x =>
{
x.DefaultAuthenticateScheme = JwtBearerDefaults.AuthenticationScheme;
x.DefaultChallengeScheme = JwtBearerDefaults.AuthenticationScheme;
}).AddJwtBearer(x =>
{
x.RequireHttpsMetadata = false;
x.SaveToken = true;
x.TokenValidationParameters = new Microsoft.IdentityModel.Tokens.TokenValidationParameters
{
ValidateIssuerSigningKey = true,
IssuerSigningKey = new Microsoft.IdentityModel.Tokens.SymmetricSecurityKey(System.Text.
ValidateIssuer = false,
ValidateAudience = false
};
100 %
No issues found
Ln: 16 Ch: 25 SPC CRLF
Error List
Entire Solution
1 Error
0 Warnings
0 Messages
Build + IntelliSense
Search Error List
Code Description Project File Line
CTC1010 The current user is not in the 'docker-users' group. Add yourself to the 'docker-users' group and then log out and back in to Windows. Auth.Demo Container.targets 198
Error List Output
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'Auth.Demo' (1 of 1 project)
Auth.Demo
Connected Services
Dependencies
Properties
Controllers
NameController.cs
UserCred.cs
appsettings.json
Dockerfile
IJWTAuthenticationManager.cs
JWTAuthenticationManager.cs
Program.cs
SigningCredentials.cs
Startup.cs
Solution Explorer Git Changes
Properties
Server Explorer Toolbox
Diagnostic Tools
Ready
Add to Source Control

Steps need to follow once the above issue get fixed.

1. **Now run the application and paste the URL in Postman-**
2. **Pass the data as below**
3. **Use data as –**
4.

{“username”:”test1”,”password”:”password1” }
A token will get generated in encrypted form. Pass the Authorization key value with generated token.

Practical no 10

Create a serverless API using Azure functions

About Azure Function:

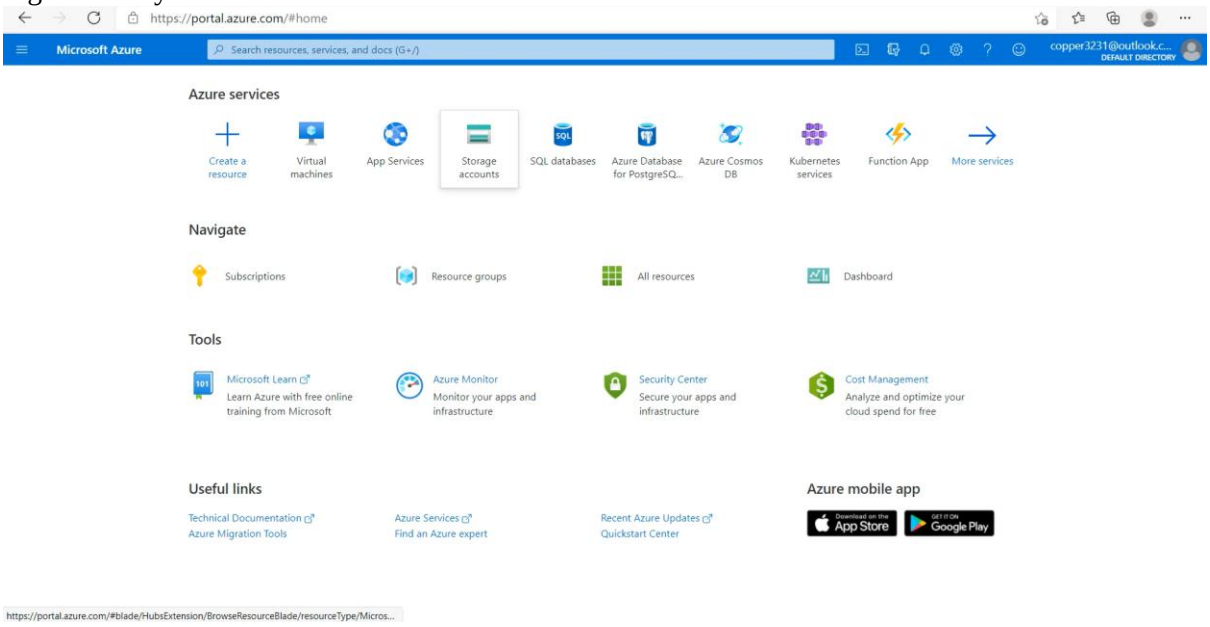
Azure Functions is a cloud service available on-demand that provides all the continually-updated infrastructure and resources needed to run your applications.
You focus on the pieces of code that matter most to you, and Azure Functions handles the rest.

Serverless = LESS Server (Your code will not run 24/7) Azure will take the code for API and save it to file.
It will not run until it gets triggered, i.e., Server will not work until someone
is really using it.

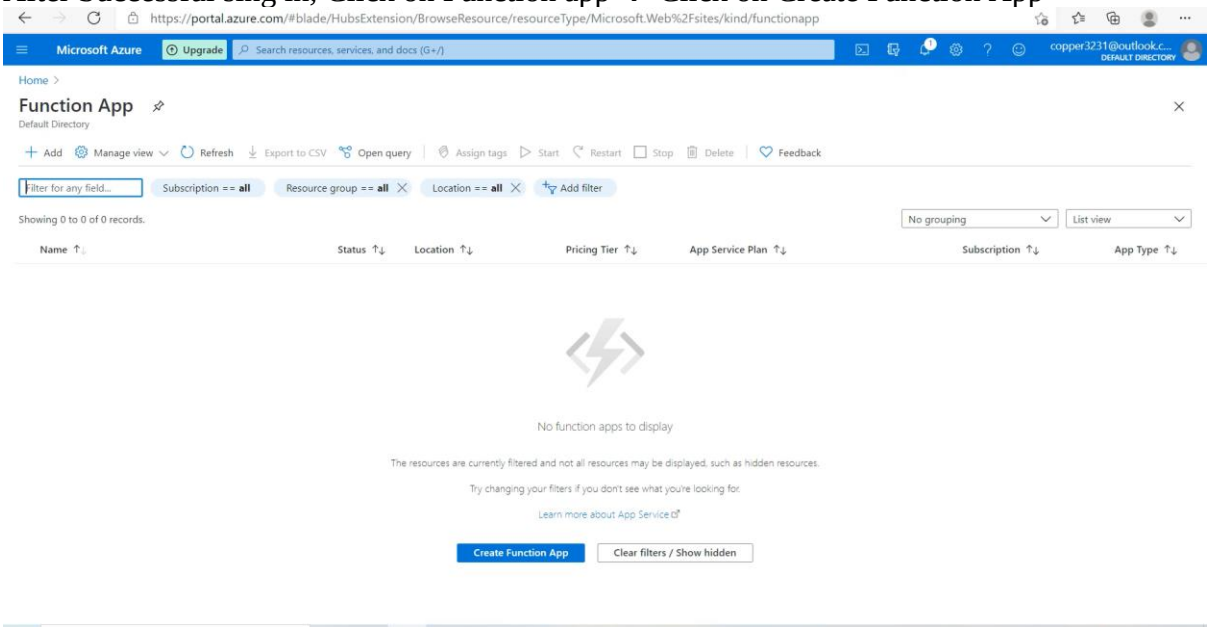
Azure has many serverless offerings, like Azure Functions, Logic Apps, Azure Storage, Cloud messaging (Event Grid), Azure bot Services two major serverless offerings, Azure Functions and Logic Apps but as per current trend and market demand, we will be exploring Azure Functions and Logic Apps.

Azure Functions is a FaaS offering—developers can write custom logic based on available triggers and execute the logic. Logic Apps is a BaaS offering where different actions and workflow conditions are available to execute a logic based on an event trigger. Both Azure Functions and Logic Apps support HTTP events, meaning both can act as standalone APIs.

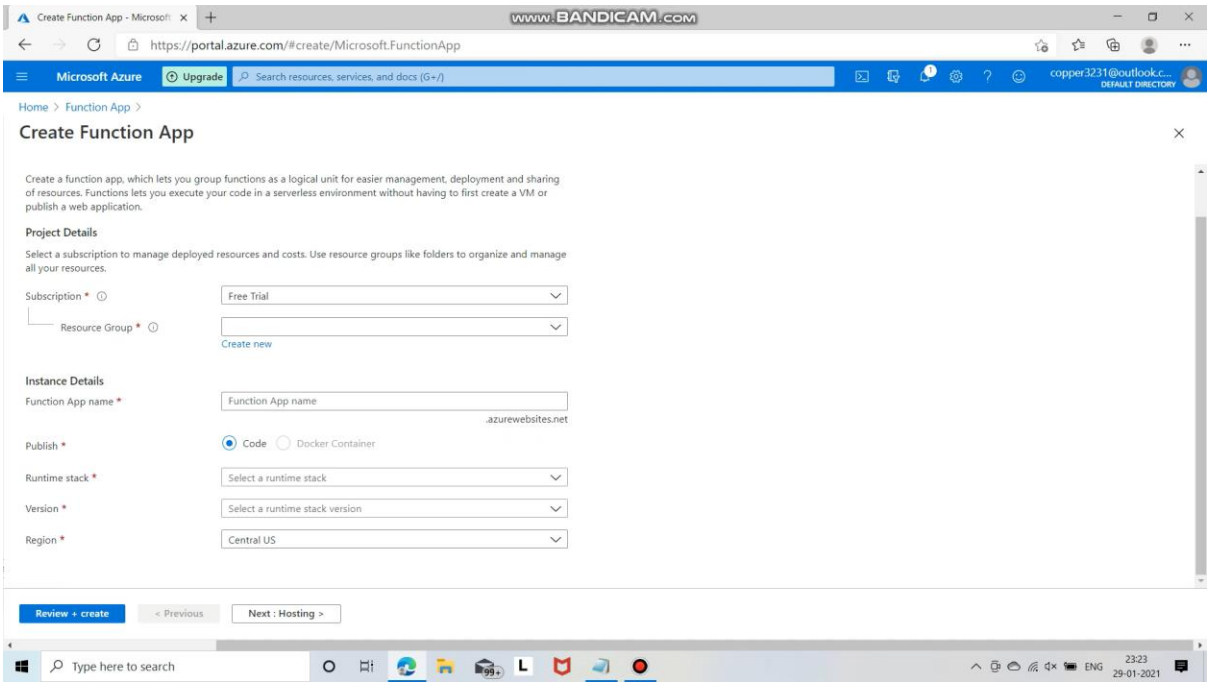
Please see below steps and screenshots to create serverless API using Azure function:
Go to Azure Portal:
[Home - Microsoft Azure]
Sign in with your Microsoft account to access various Azure functionalities



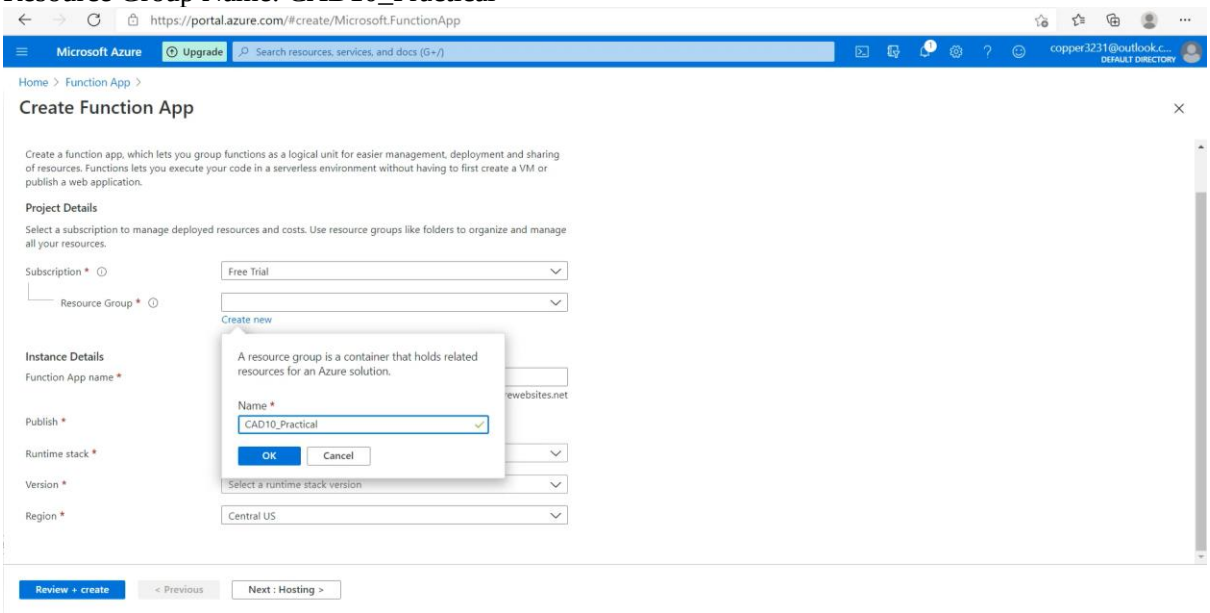
After Successful sing in, Click on Function app → Click on Create Function App



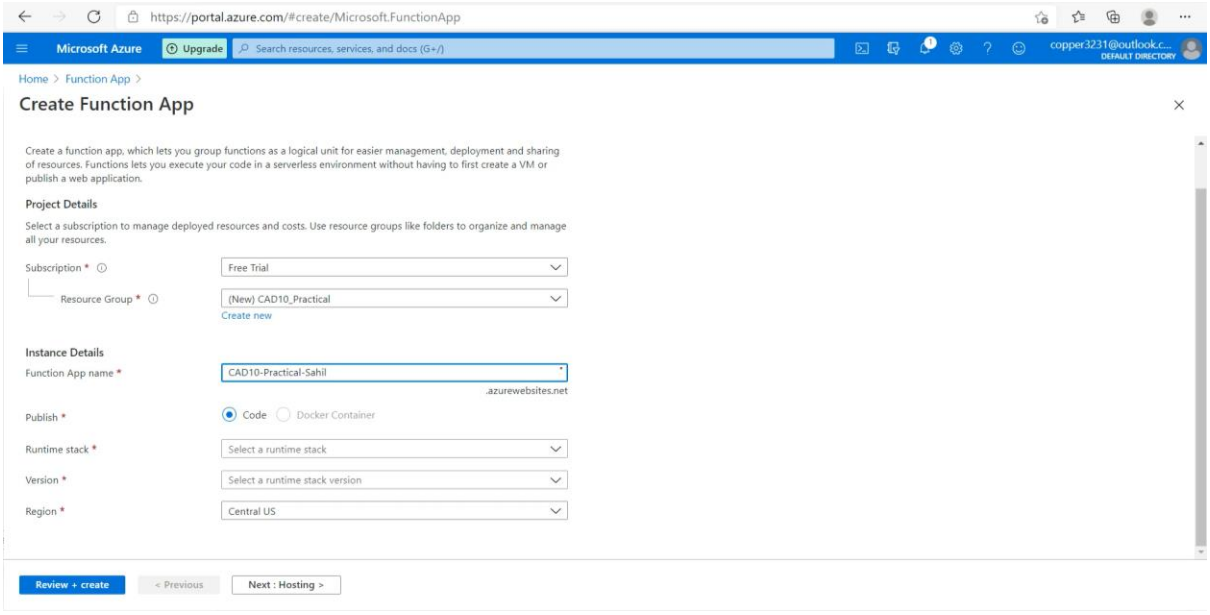
Click on Resource Group → Create New



Resource Group Name: CAD10_Practical

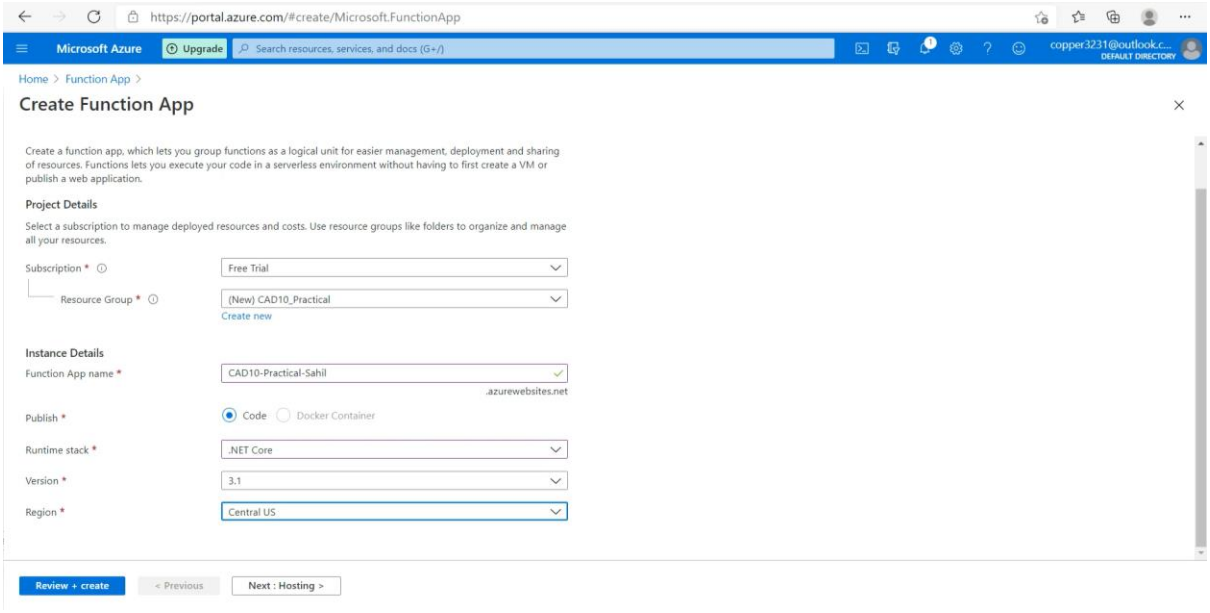


Function App Name: CAD10_Practical_Sahil

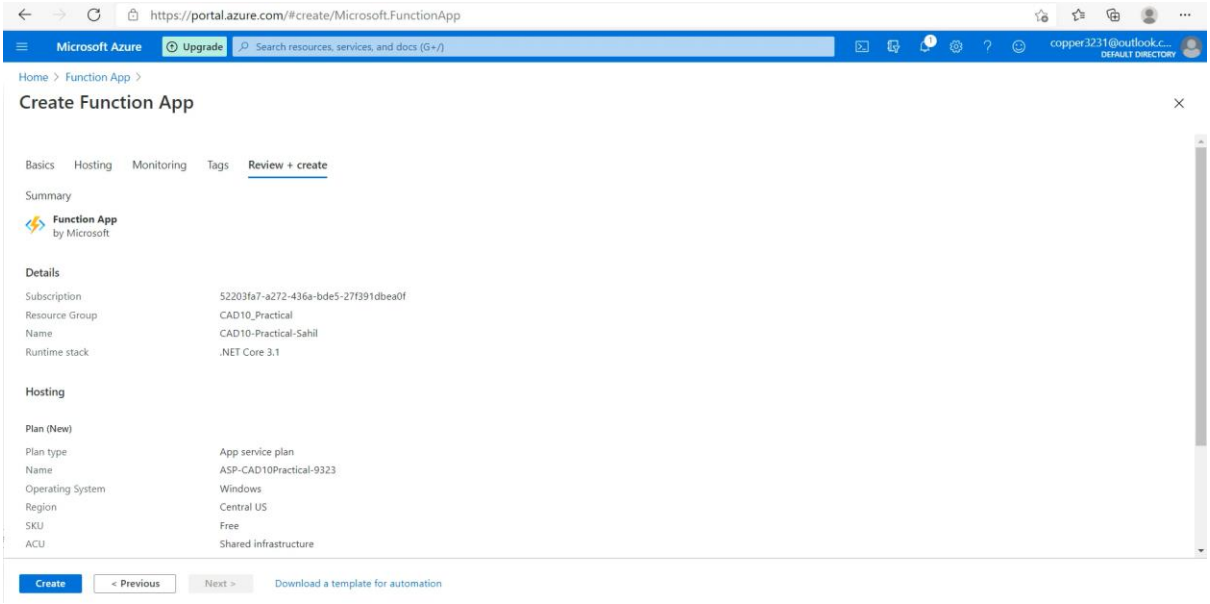


Runtime stack: .NET Core
Version 3.1
Region: Central US

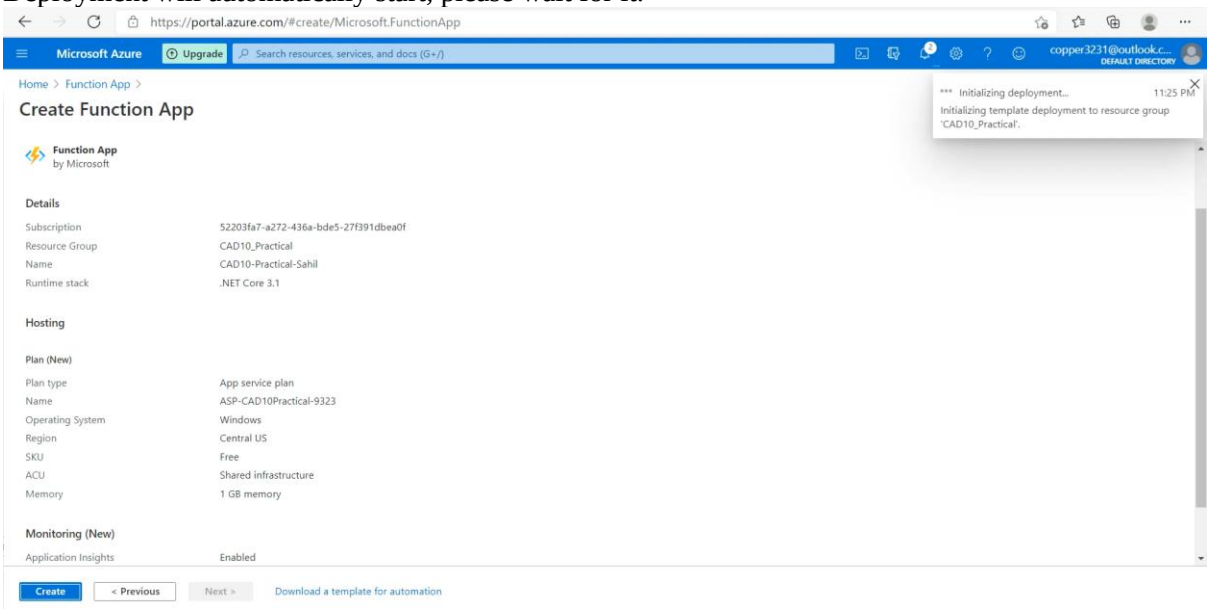
Click on Review and Create:

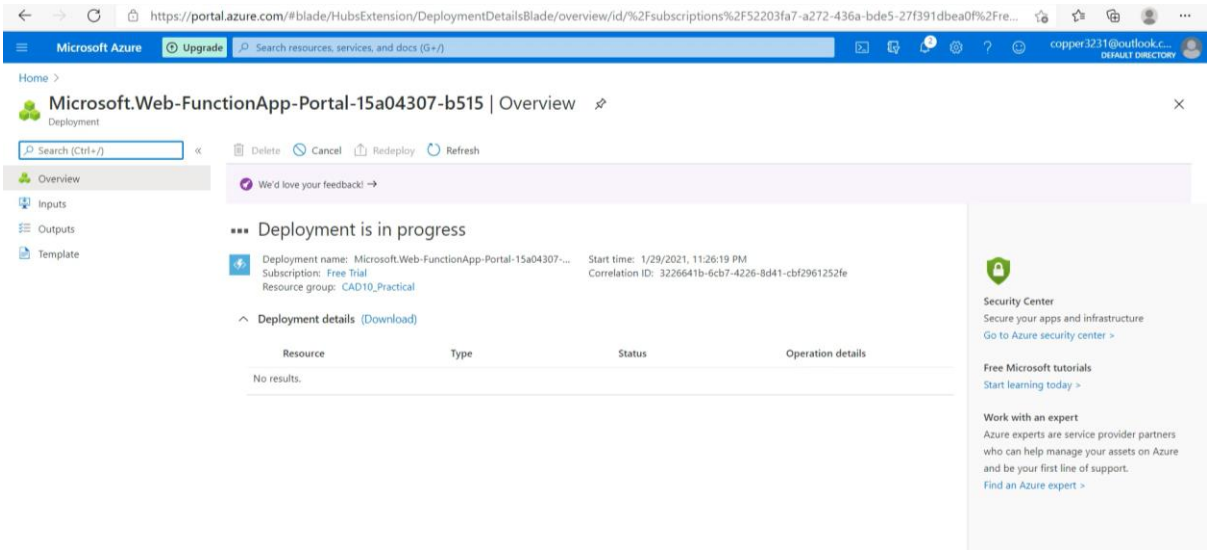


After review, click on Create:

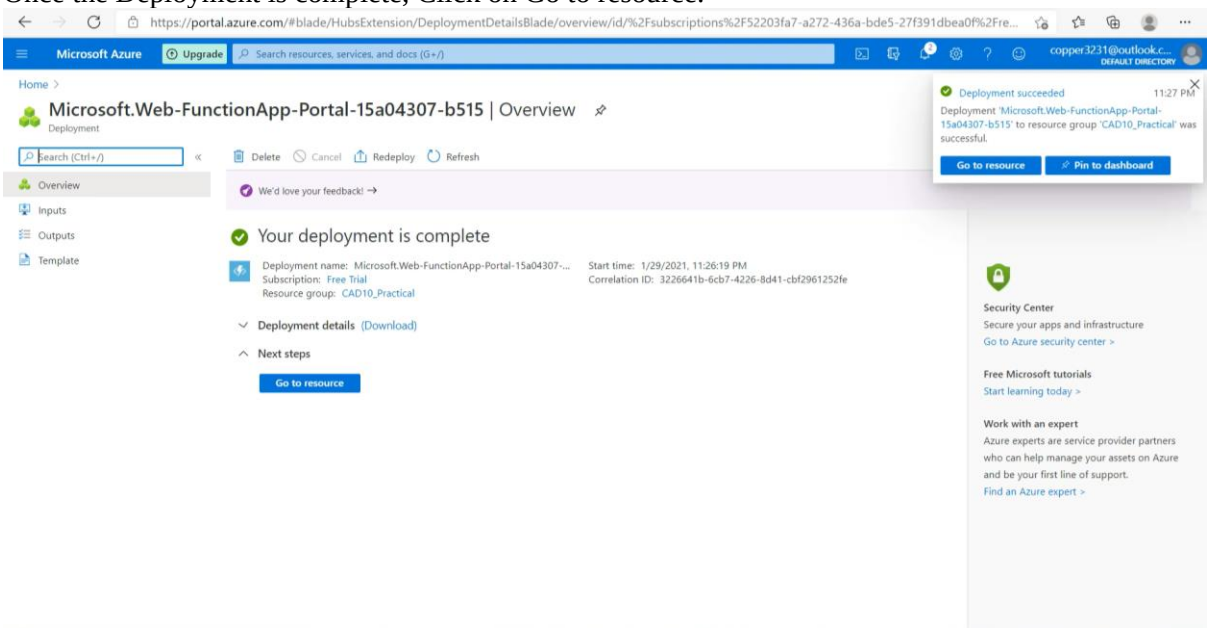


Deployment will automatically start, please wait for it.

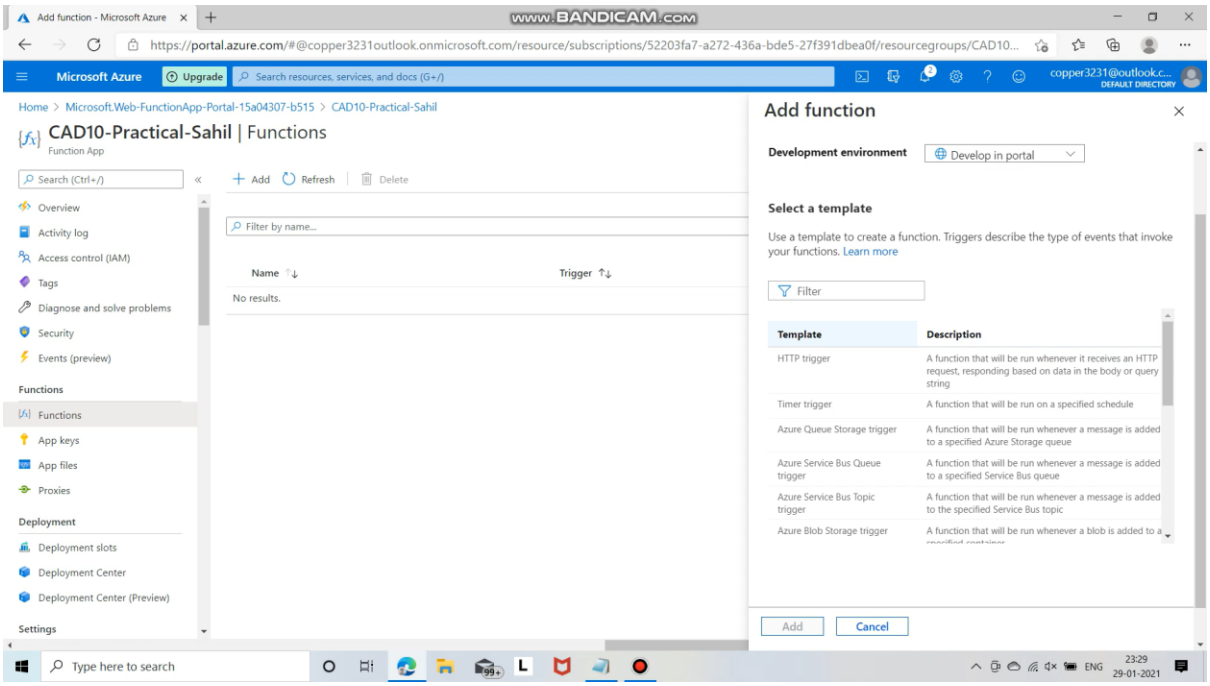




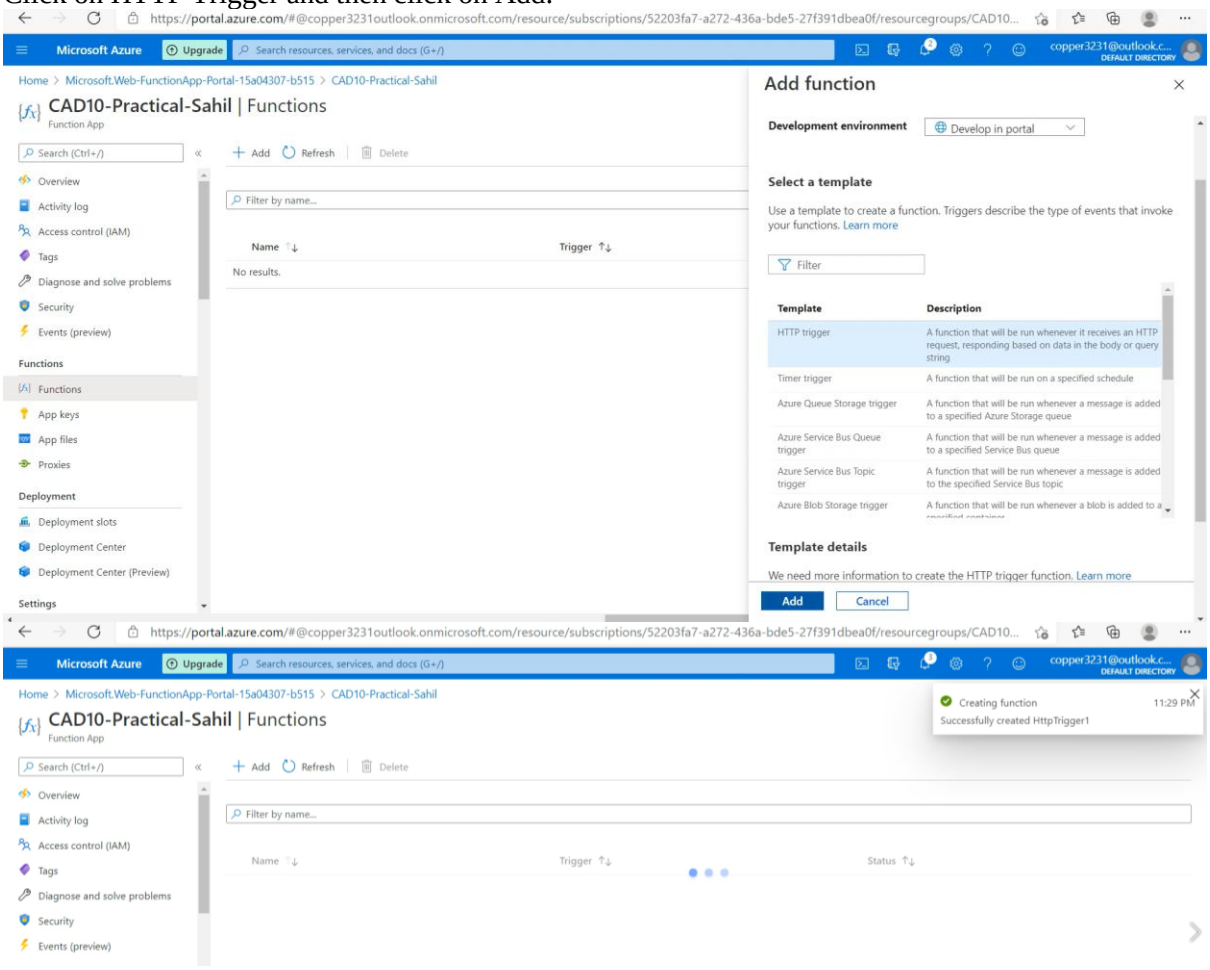
Once the Deployment is complete, Click on Go to resource:



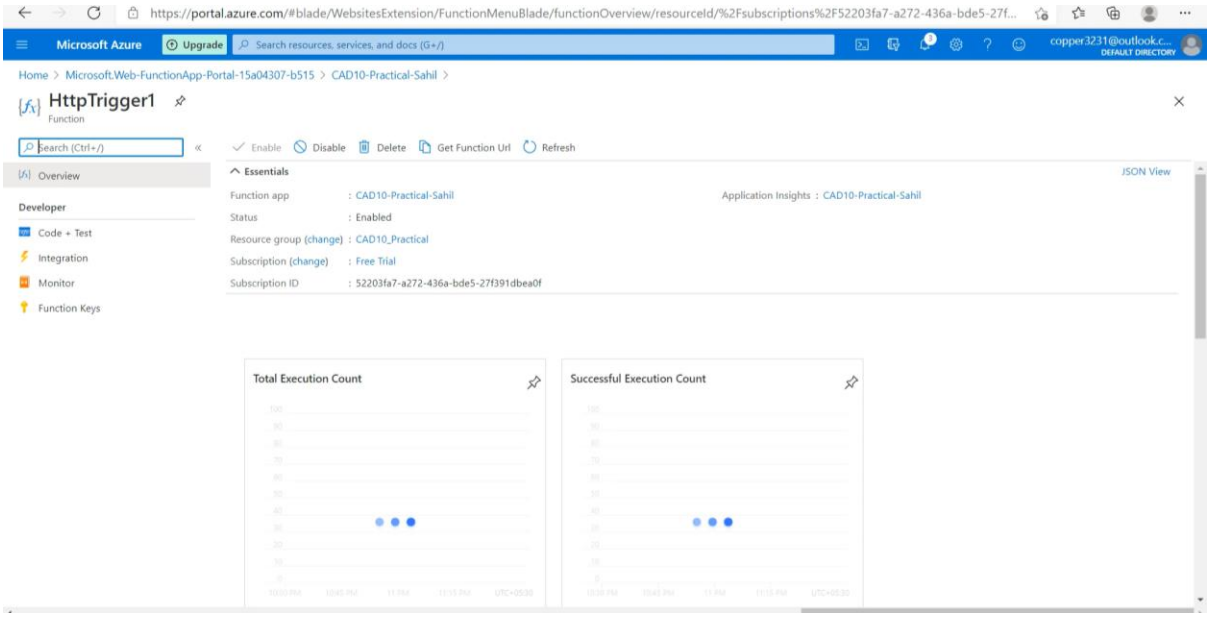
Click on Functions → Add



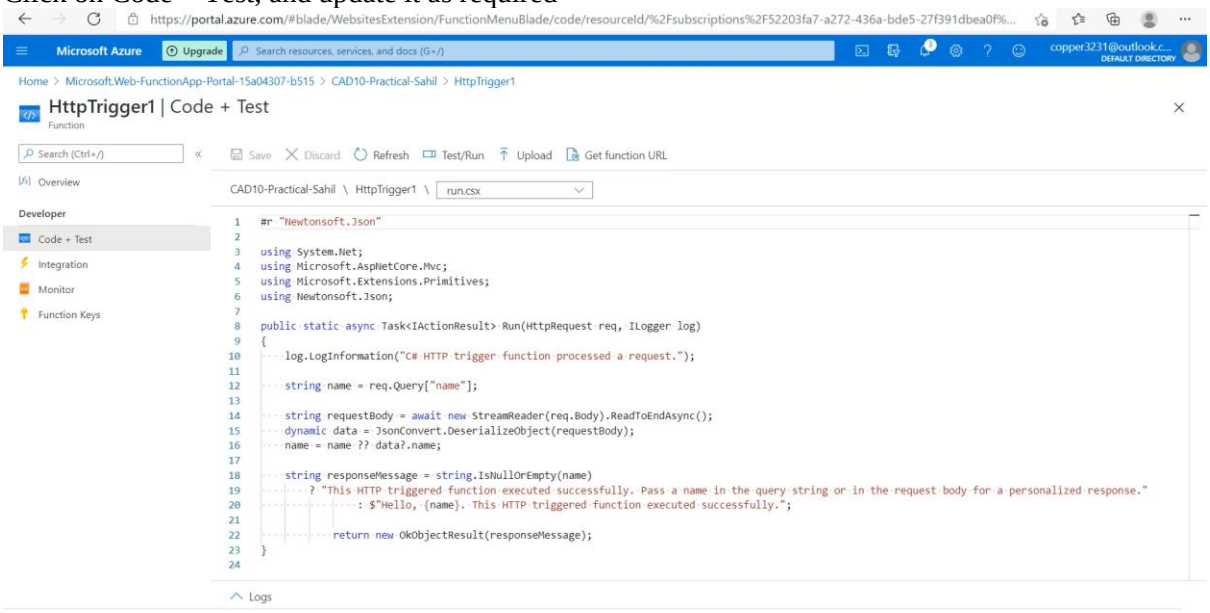
Click on HTTP Trigger and then click on Add:

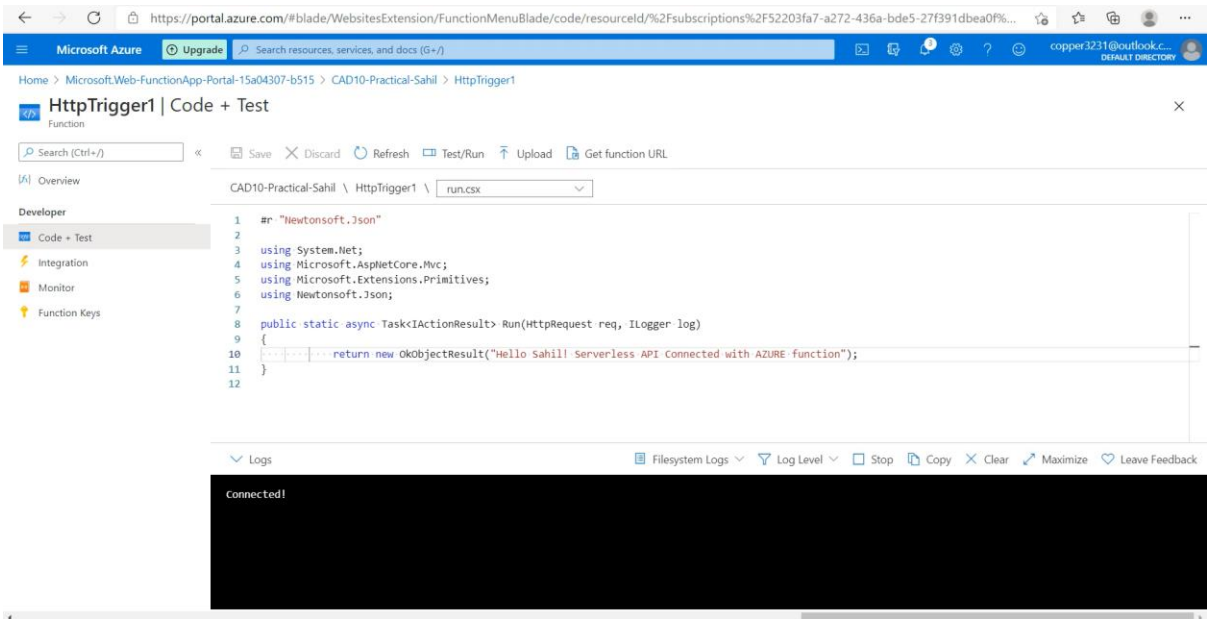


Once the HTTP Trigger get created, you will see all the details about it.

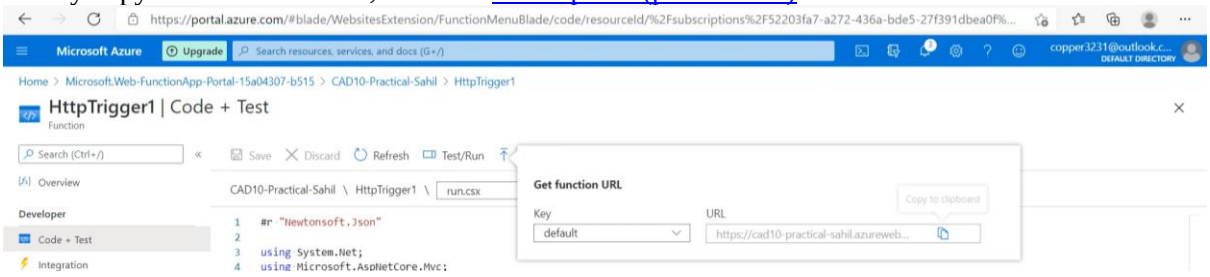


Click on Code + Test, and update it as required

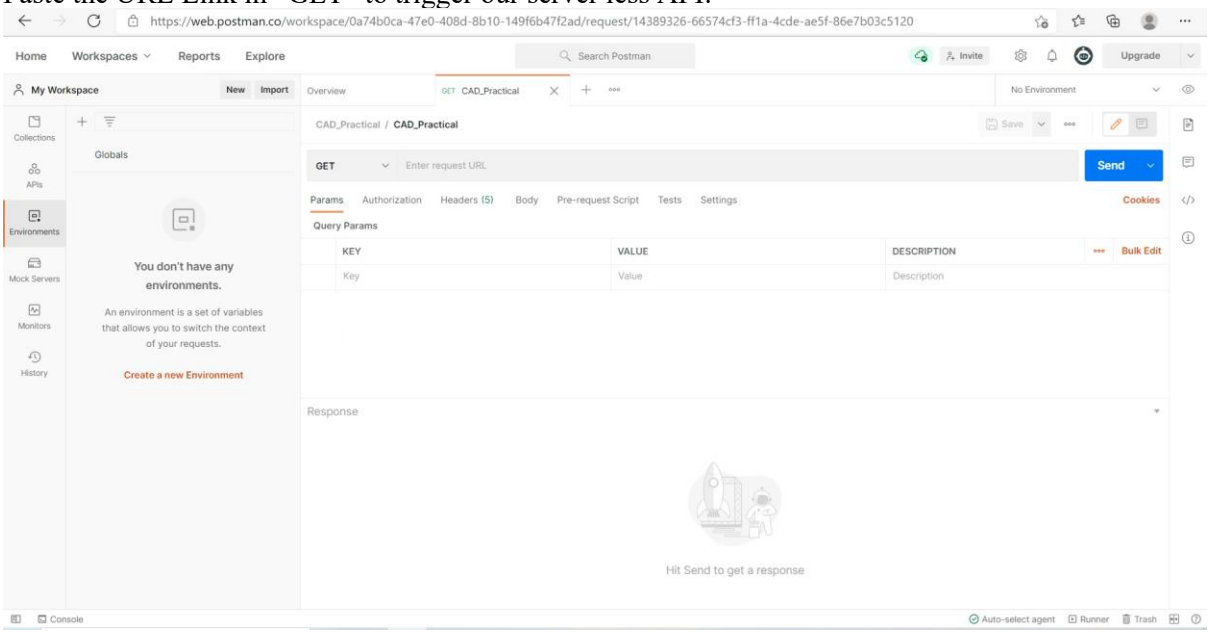




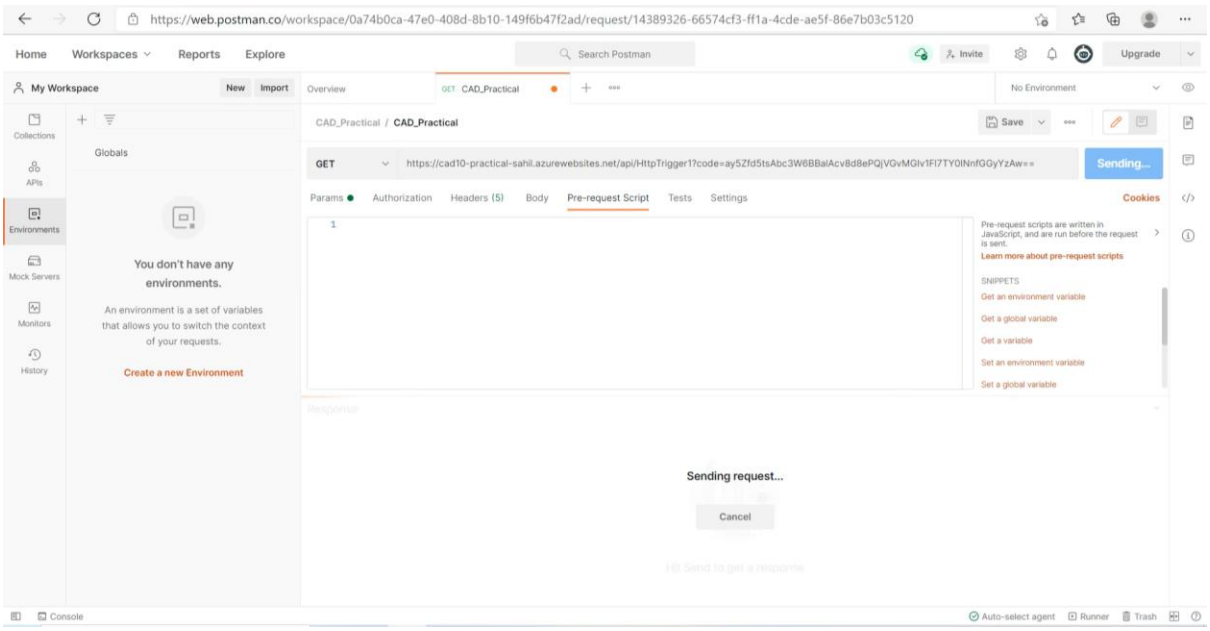
Kindly copy the Function URL, and visit [Workspaces (postman.co)]



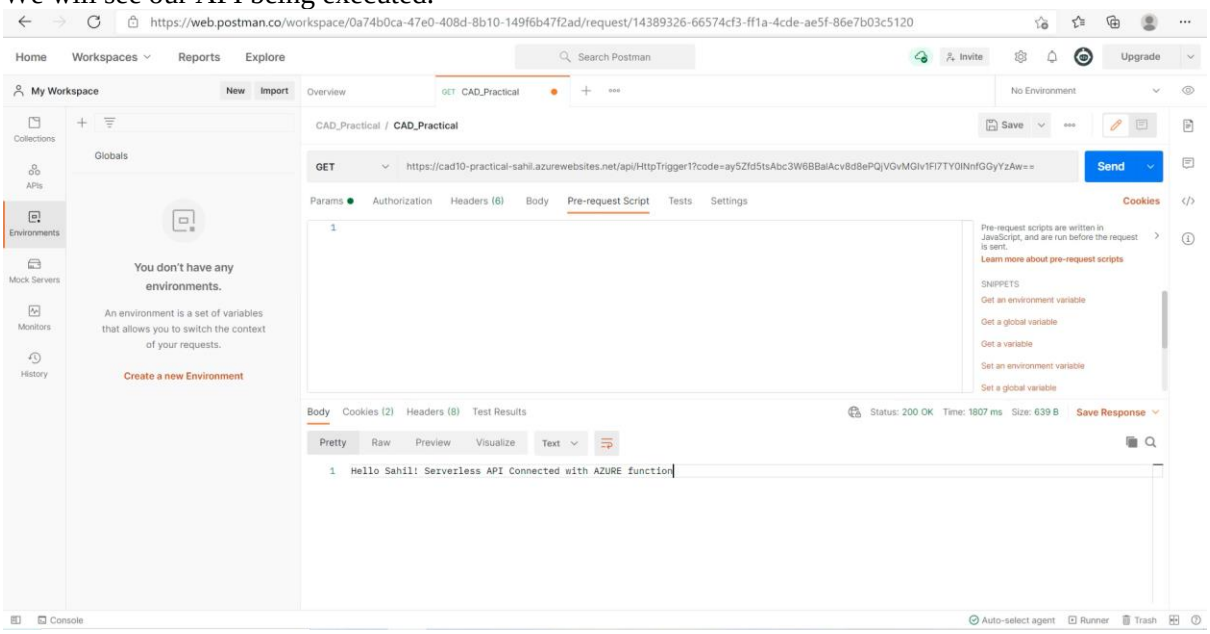
Paste the URL Link in “GET” to trigger our server less API:



Click on Send:



We will see our API being executed:



Practical no 11

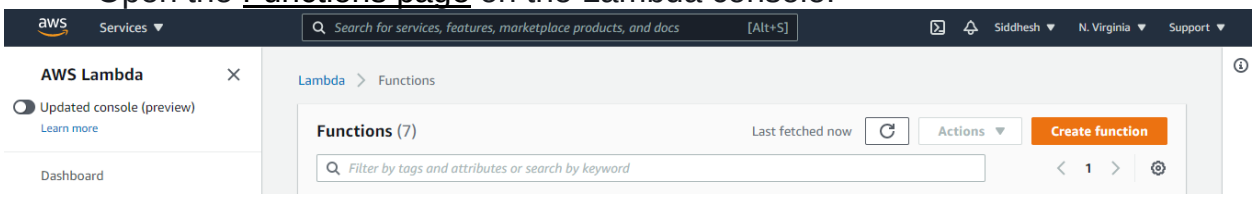
Create AWS Lambda Function

Create AWS Lambda function:

To create a Lambda function with the console

Step 1:

Open the Functions page on the Lambda console.



Step 2:

Choose **Create function**.

Step 3:

Under **Basic information**, do the following:

a. For **Function name**, enter `mypractcad11`

b. For **Runtime**, confirm that **python 3.8** is selected.

Step 4:

Choose **Create function**

.

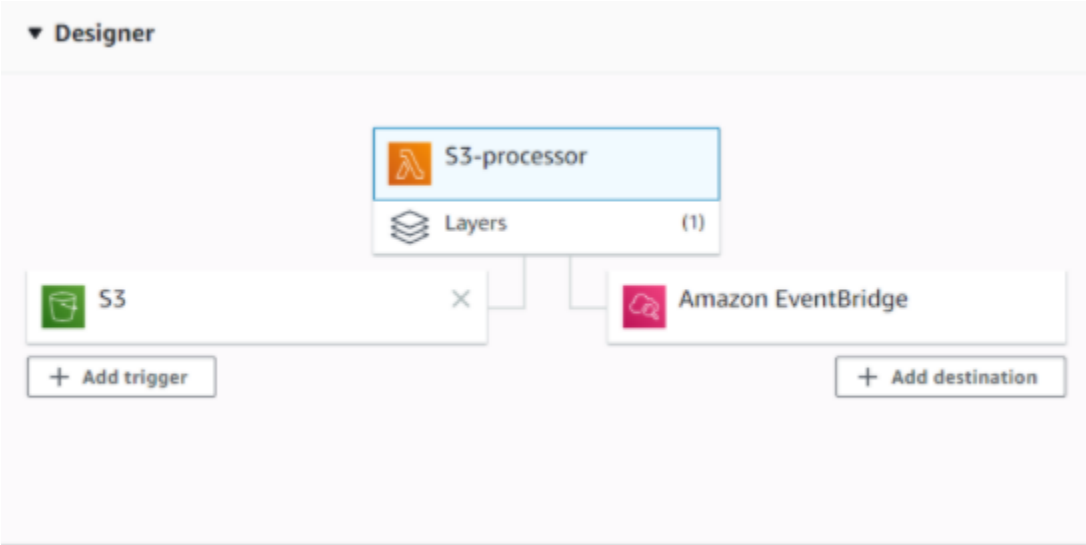
Step 5:

Lambda creates a **python3.8** function and an execution role that grants the function permission to upload logs. The Lambda function assumes the execution role when you

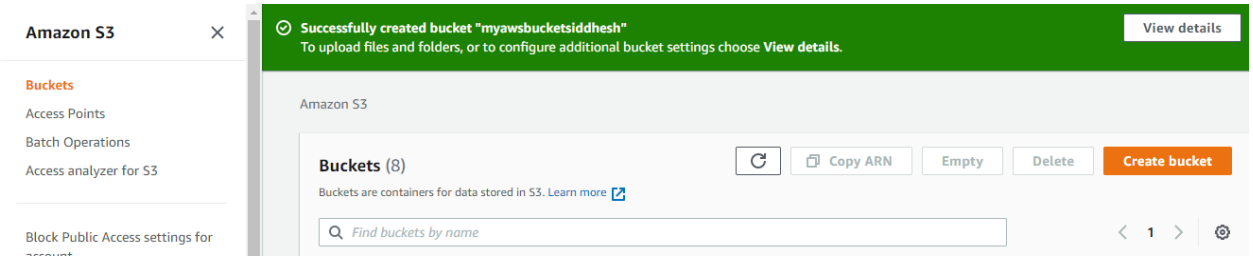
invoke your function, and uses the execution role to create credentials for the AWS SDK and to read data from event sources.

Step 5:

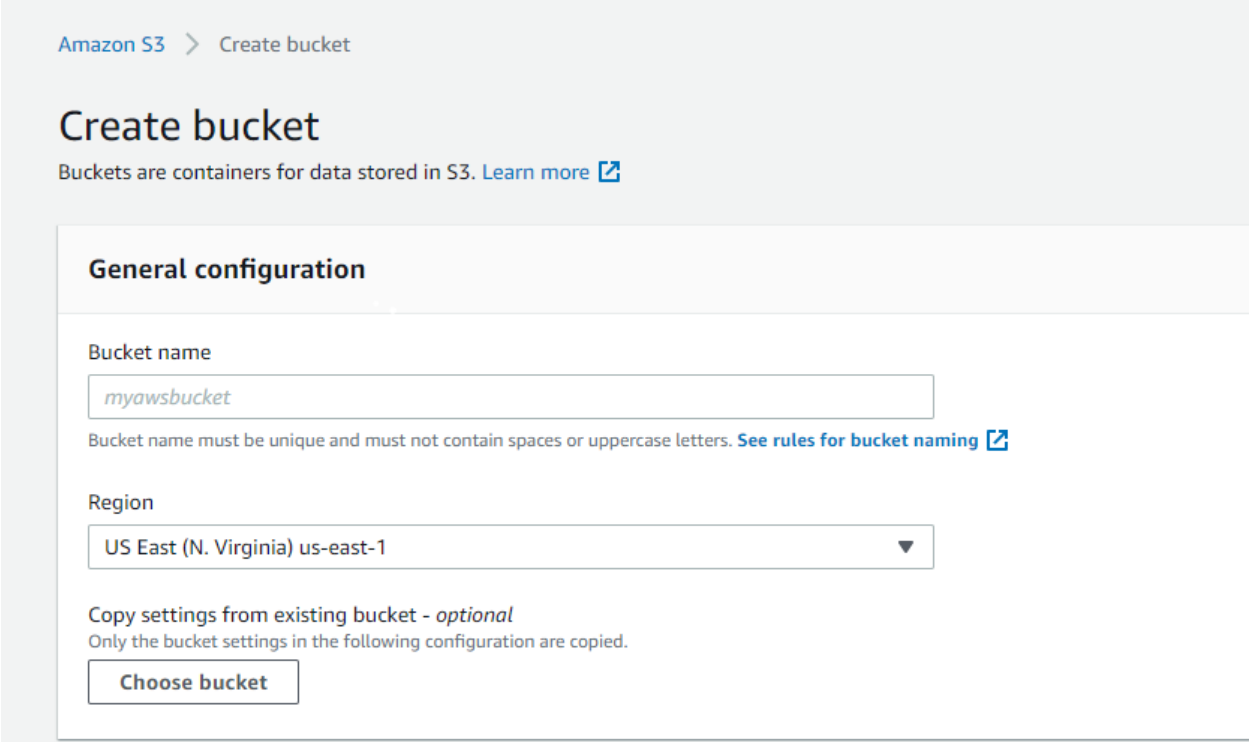
Use the designer: For Create the S3 Bucket



Step 6:
Search for s3 Bucket and click on Create bucket.

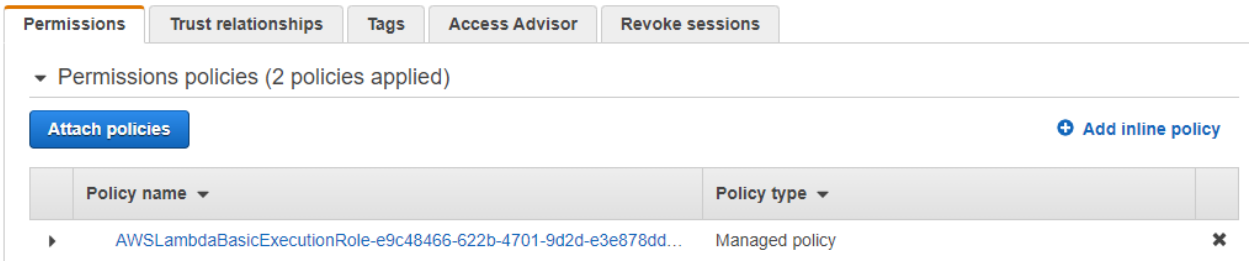


Step 7:

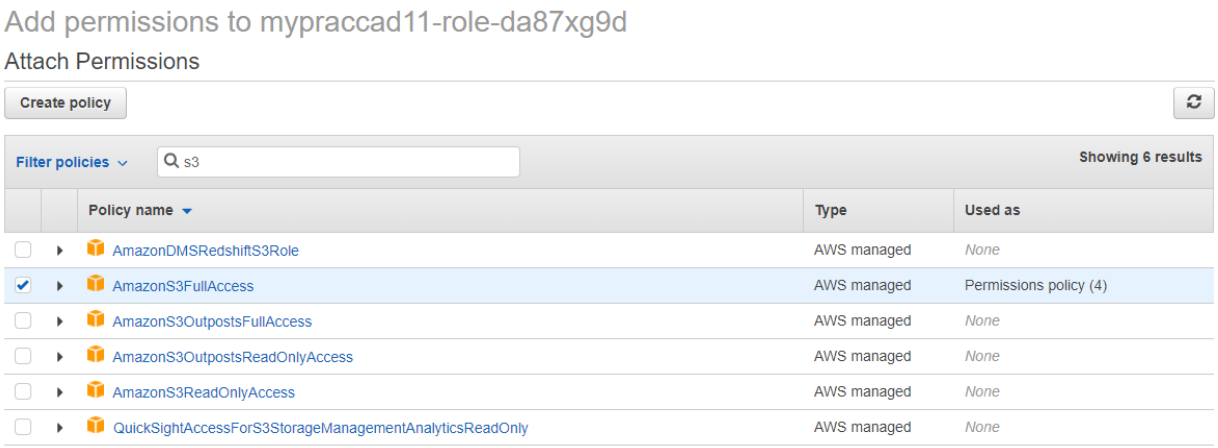


Step 8:
Search for IAM- Identity and Access Management

Click on Roles leftside & selected Function which created earlier



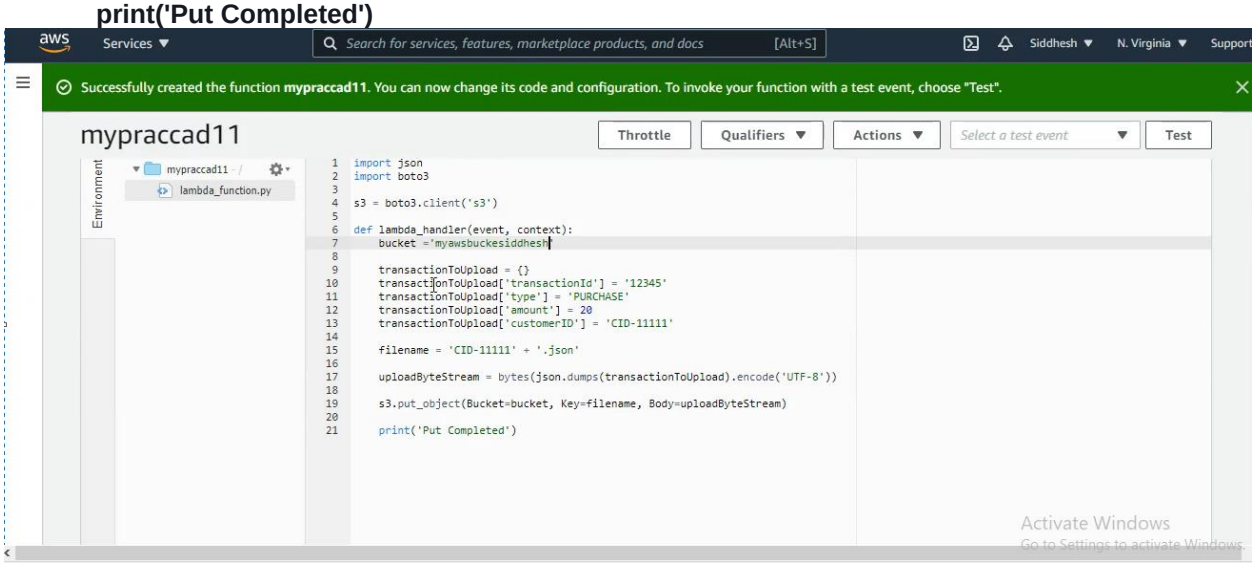
Step 9:
Give permission to that function "AmazonS3FullAccess" if we will not give that acces it's shows an error



Step 10:

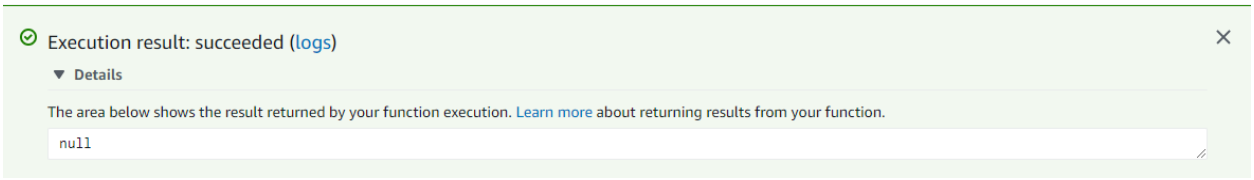
Type our Code in Lambda.py console

```
import json
import boto3
s3 = boto3.client('s3')
def lambda_handler(event, context):
        bucket ='vikascollegedemo'
        transactionToUpload = {}
        transactionToUpload['transactionId'] = '12345'
        transactionToUpload['type'] = 'PURCHASE'
        transactionToUpload['amount'] = 20
        transactionToUpload['customerID'] = 'CID-11111'
        filename = 'CID-11111' + '.json'
        uploadByteStream = bytes(json.dumps(transactionToUpload).encode('UTF-8'))
        s3.put_object(Bucket=bucket, Key=filename, Body=uploadByteStream)
        print('Put Completed')
```

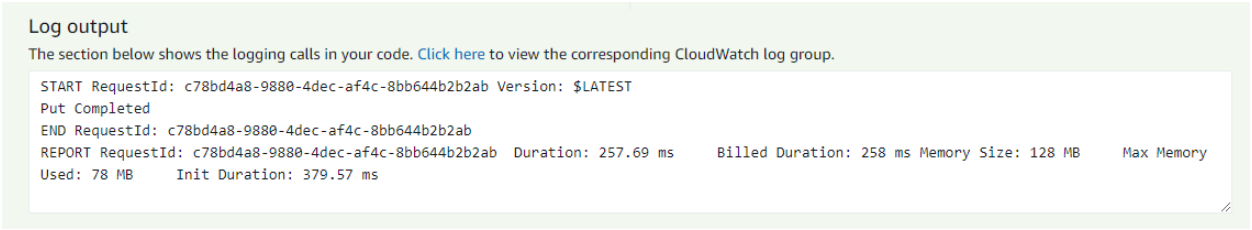


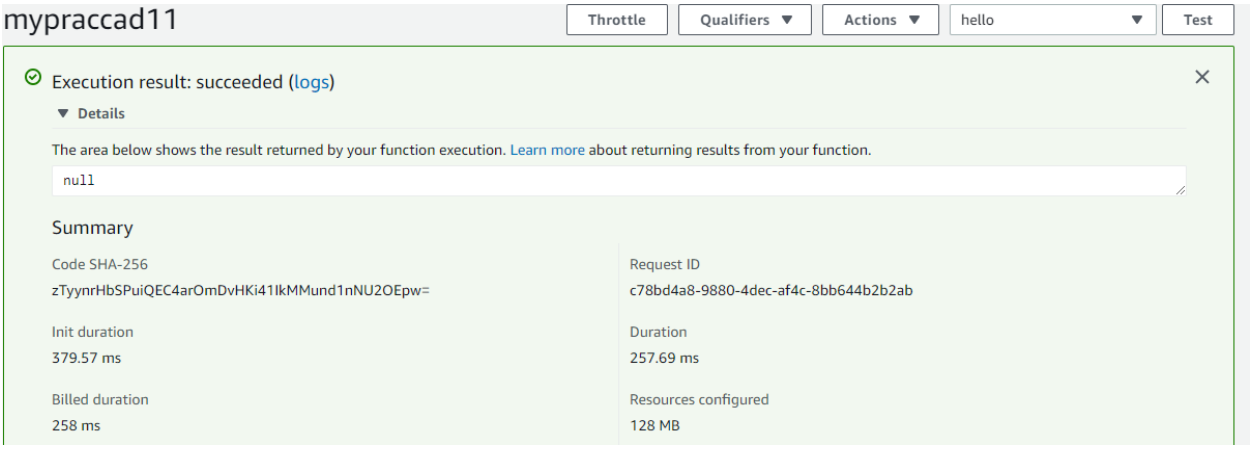
Step 11:

After deploying SourceCode Click on “Test Button” and output will be shown

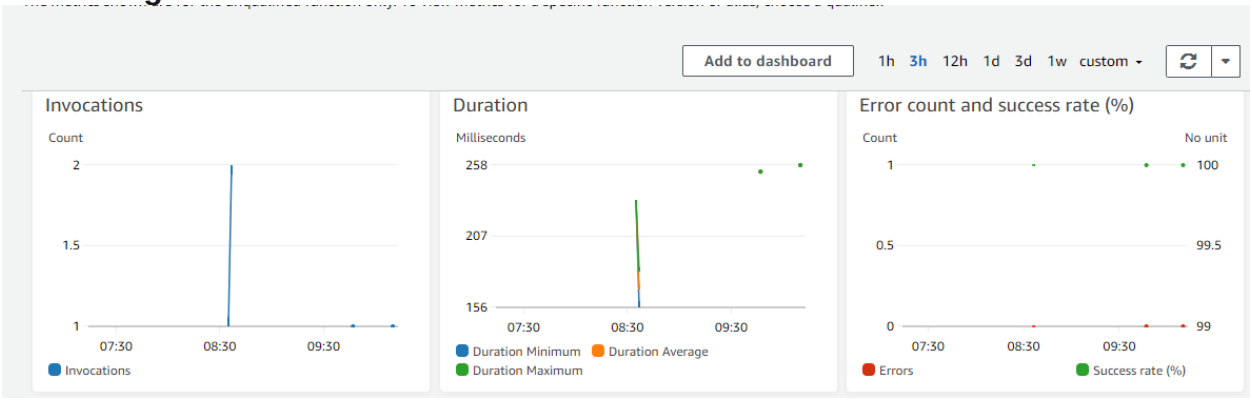


Output:

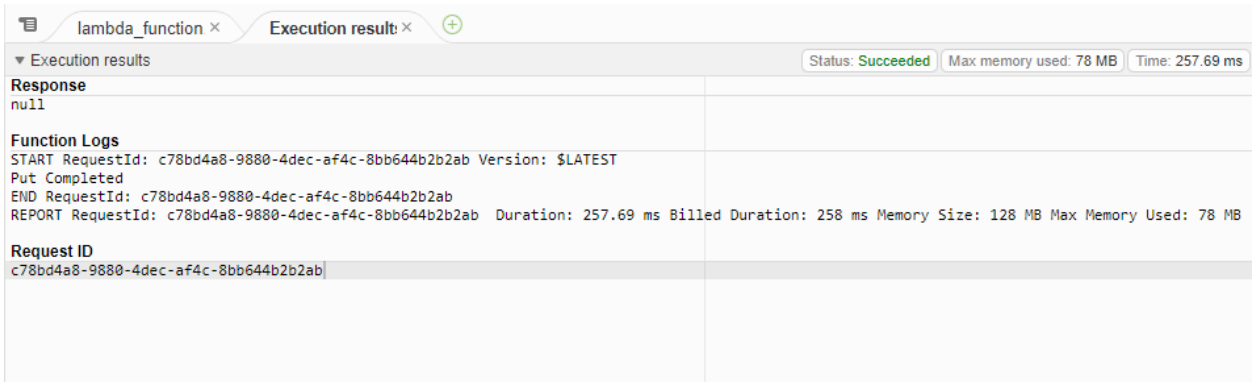




Monitoring Result:



Execution Result:


lambda_function
Execution result
Execution results
Status: Succeeded
Max memory used: 78 MB
Time: 257.69 ms
Response
null
Function Logs
START RequestId: c78bd4a8-9880-4dec-af4c-8bb644b2b2ab Version: $LATEST
Put Completed
END RequestId: c78bd4a8-9880-4dec-af4c-8bb644b2b2ab
REPORT RequestId: c78bd4a8-9880-4dec-af4c-8bb644b2b2ab Duration: 257.69 ms Billed Duration: 258 ms Memory Size: 128 MB Max Memory Used: 78 MB
Request ID
c78bd4a8-9880-4dec-af4c-8bb644b2b2ab

Practical no 12

Build AWS Lambda using API Gateway

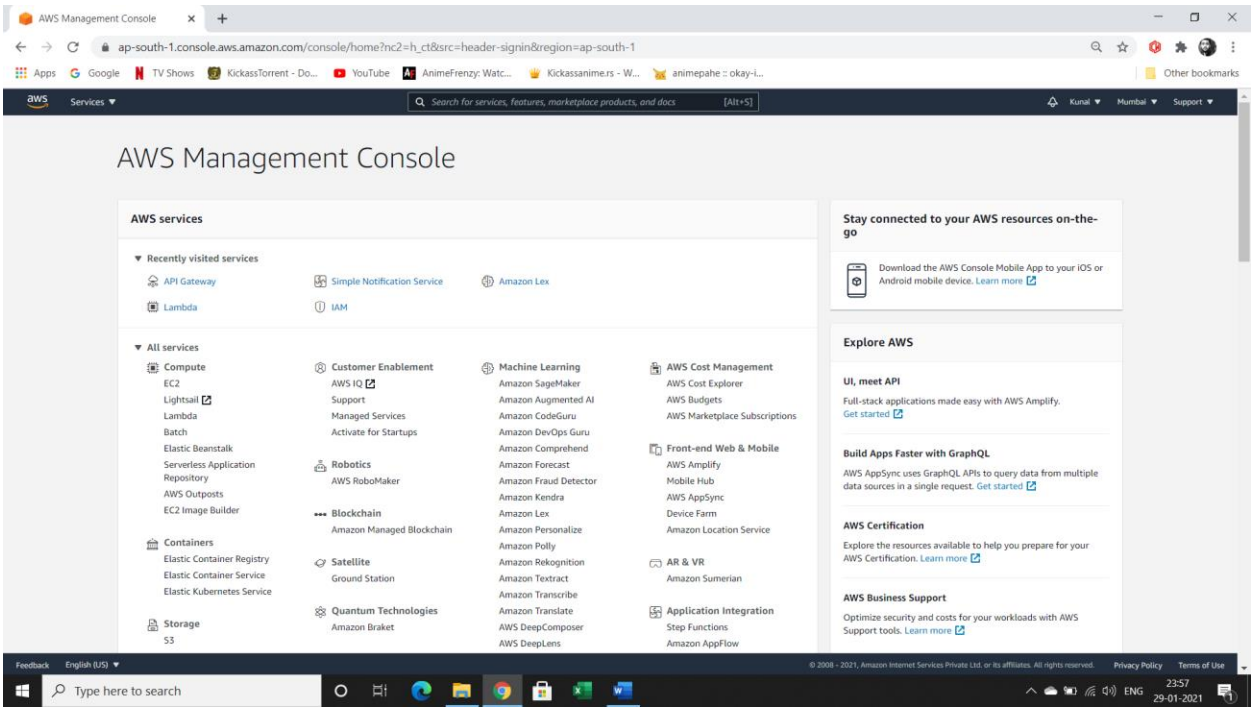
Description of Practical: -

- In this practical we will learn to build AWS Lambda function using API Gateway.
- In order to perform this practical we will take an example.
- The example is EMI Calculator.

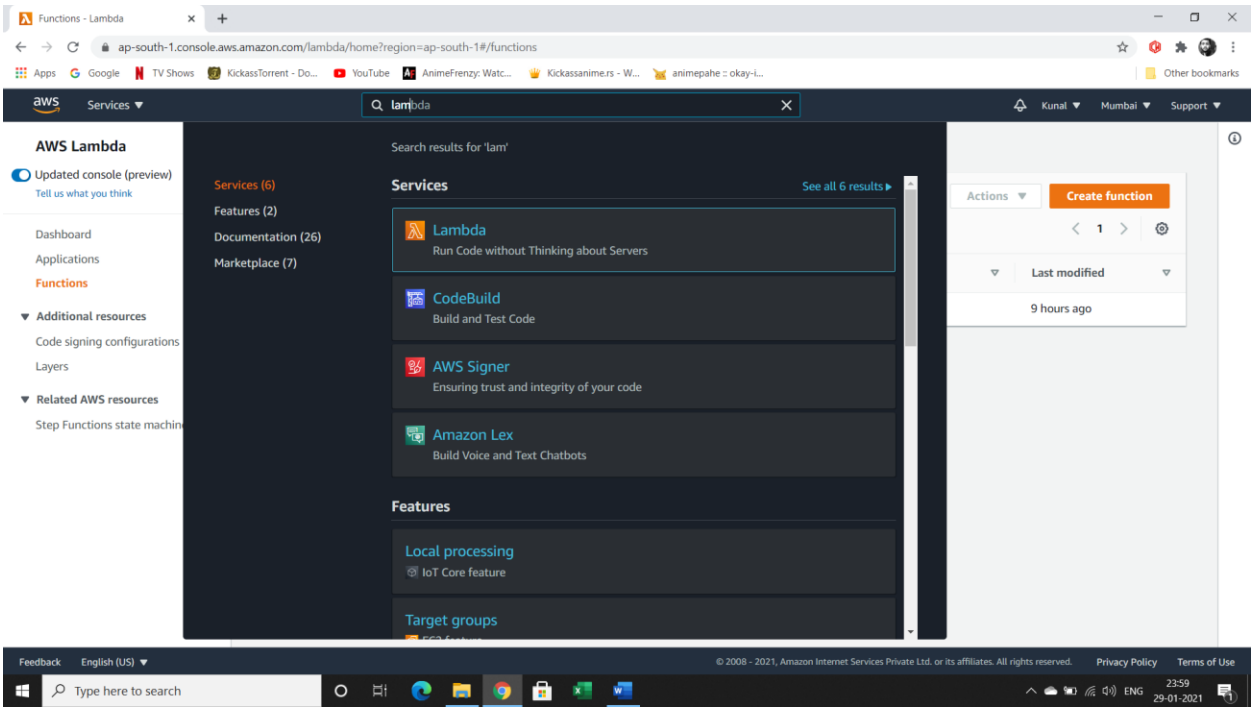
EMI Calculator

Steps

- Login into AWS Console.
- Search for Lambda Function on the service bar.

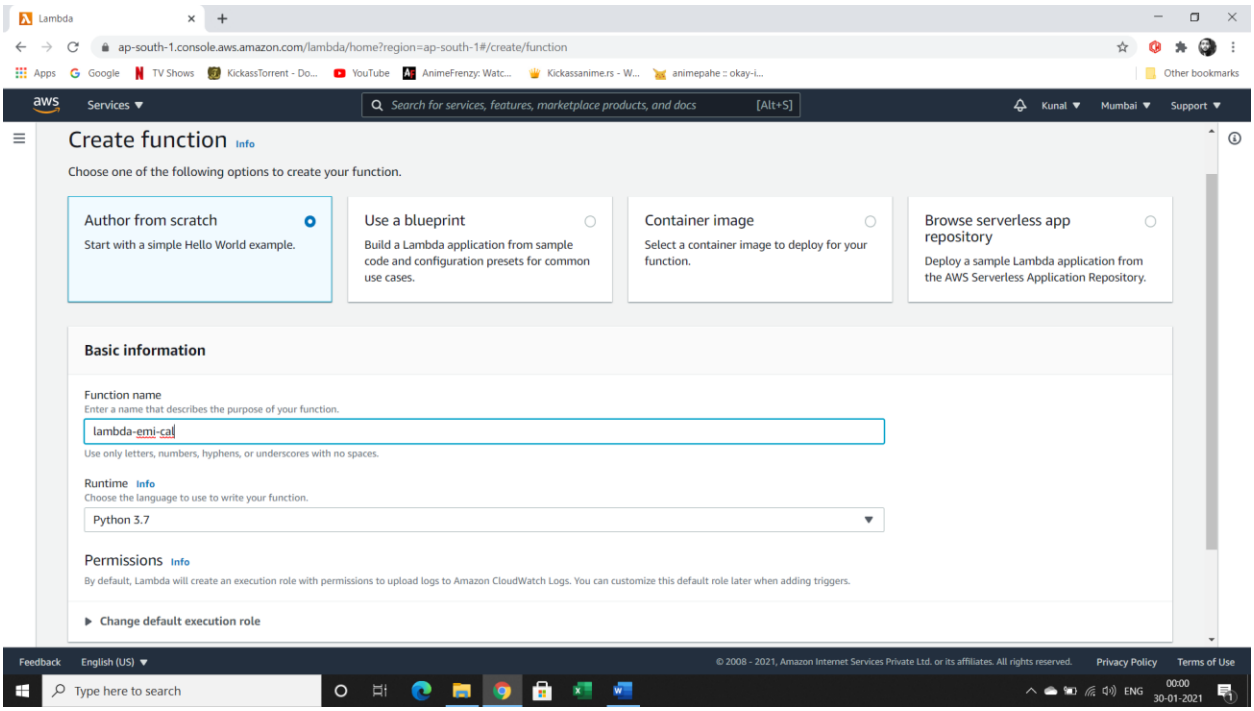


- Here we will create a lambda function for the practical.



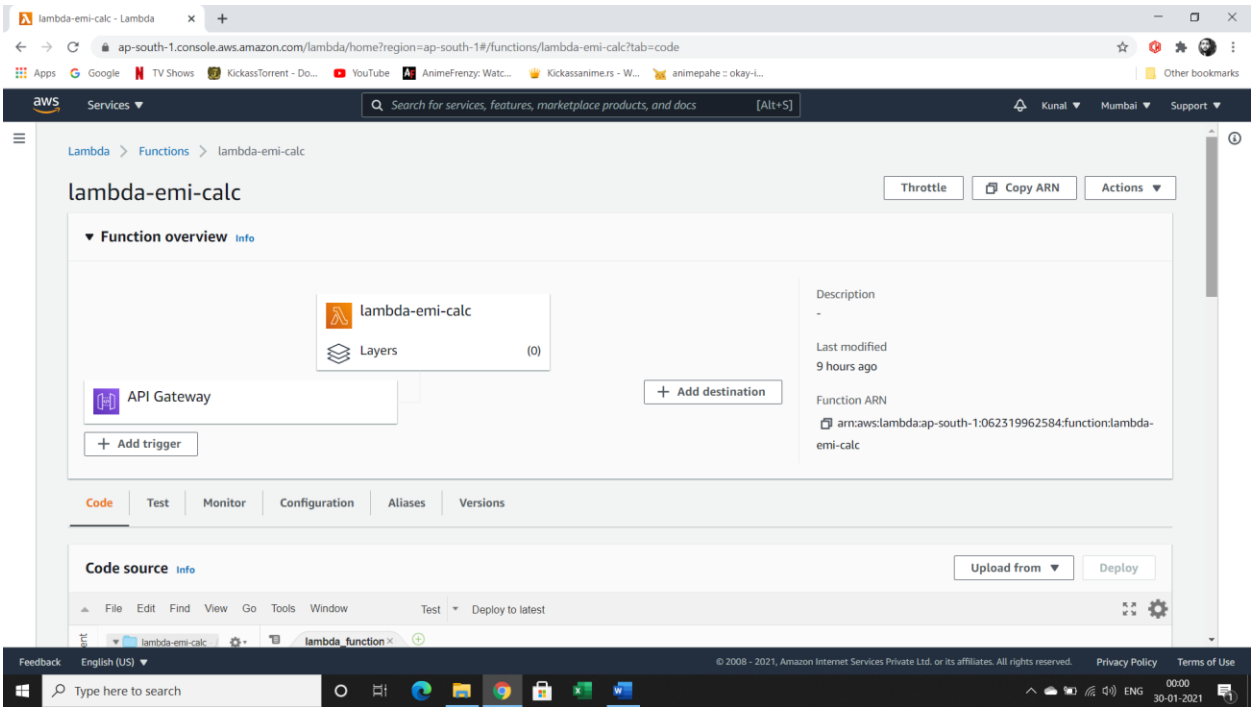
- Click on Create Function on the Lambda Tab.

- Here we will choose Author from Scratch.



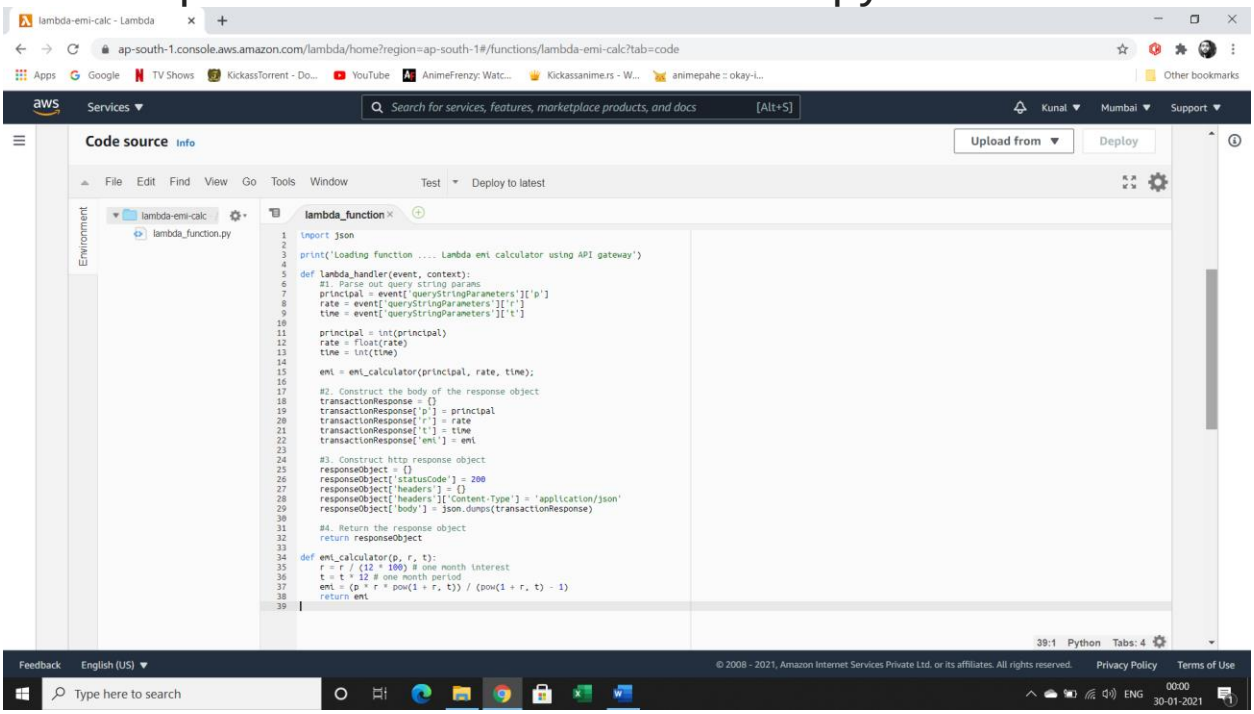
- After selecting that write the function name as lambda-emi-calc
- We will be running the code on python 3.7
- So, we will choose runtime as python 3.7.
- After that click on create function.

- We will see that it has created lambda function with basic default code.



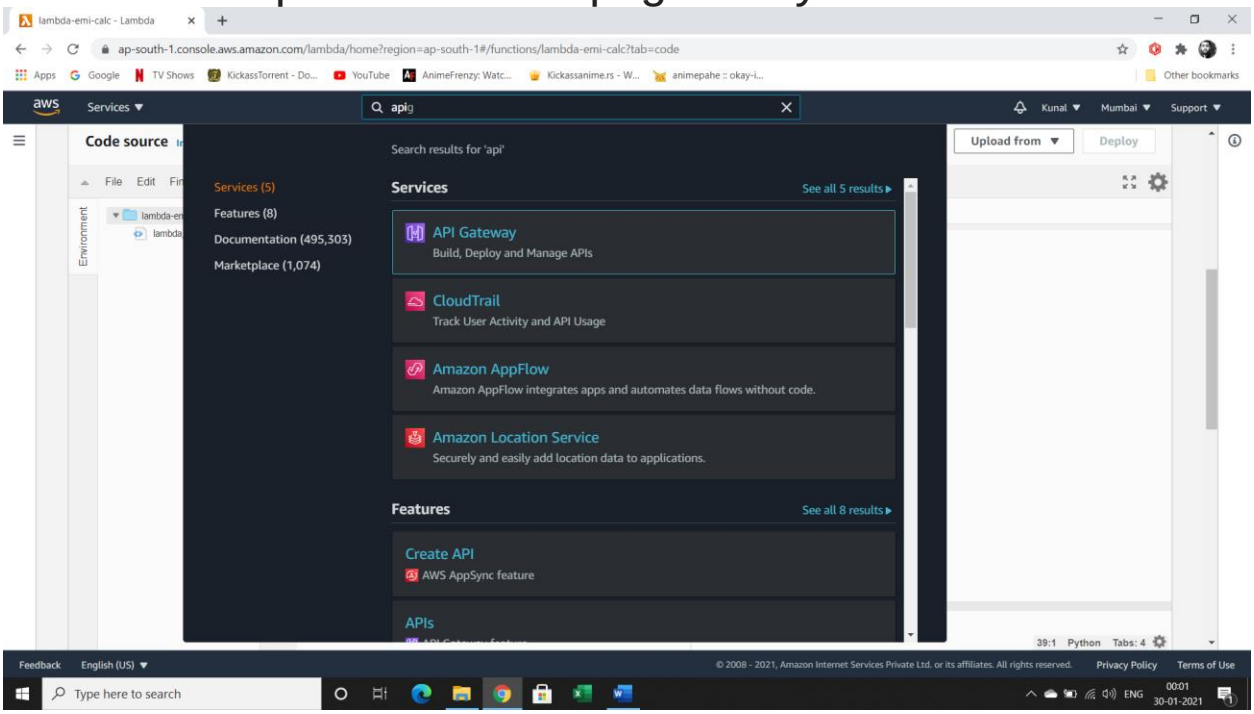
- We can see that it has created lambda function with basic default code

- Next step is to enter the emi calculator python code

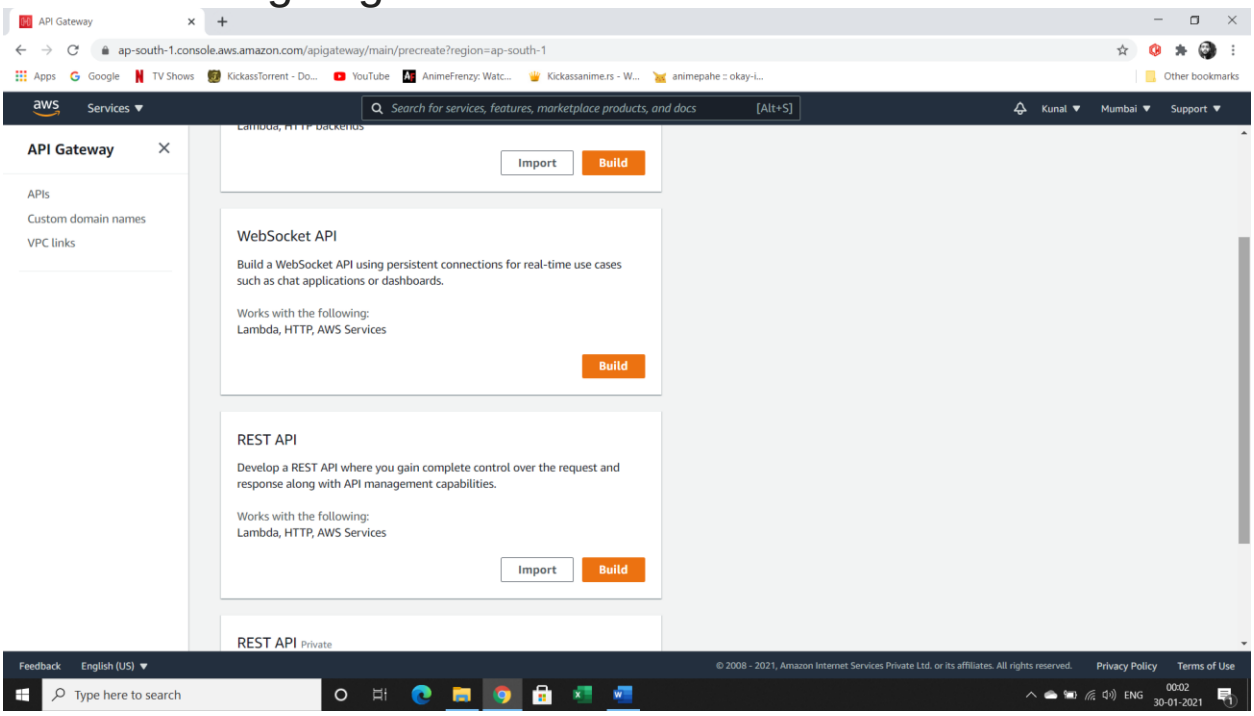


- Save the lambda function
- We are not defining any environment variable
- Select basic setting and choose runtime as python 3.7

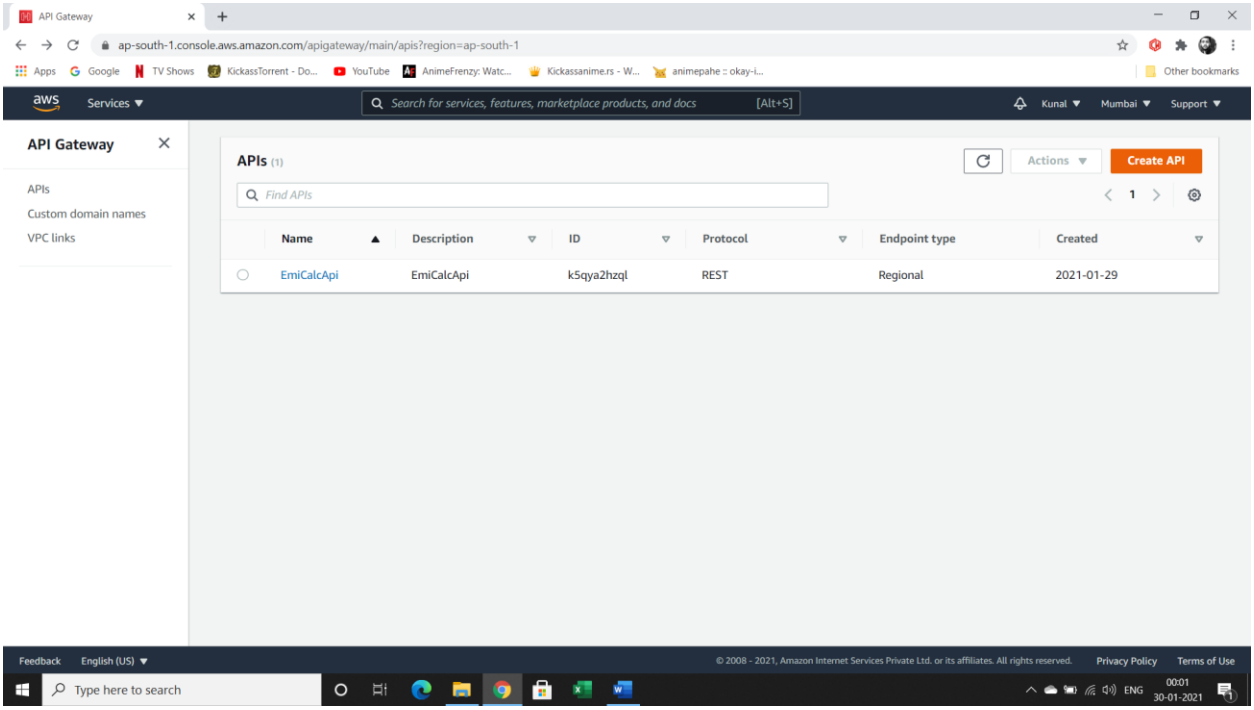
- Next step is to create api gateway



- We are going to choose REST API

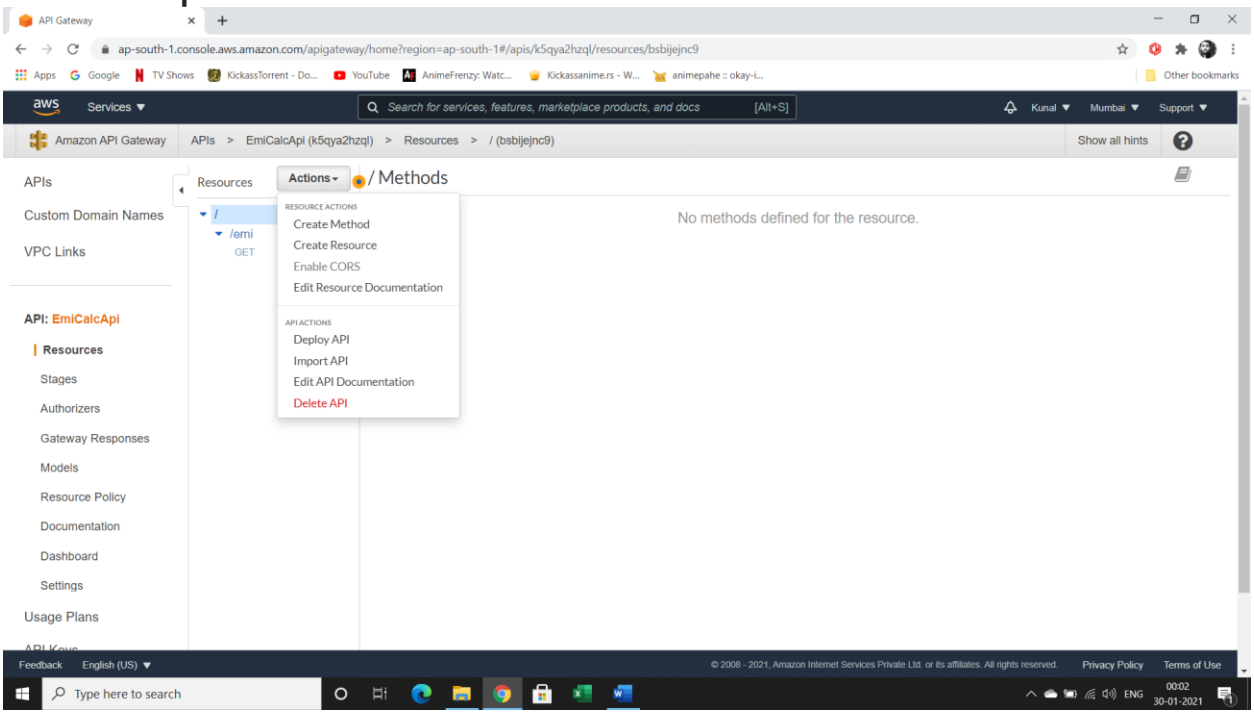


- Click on new API



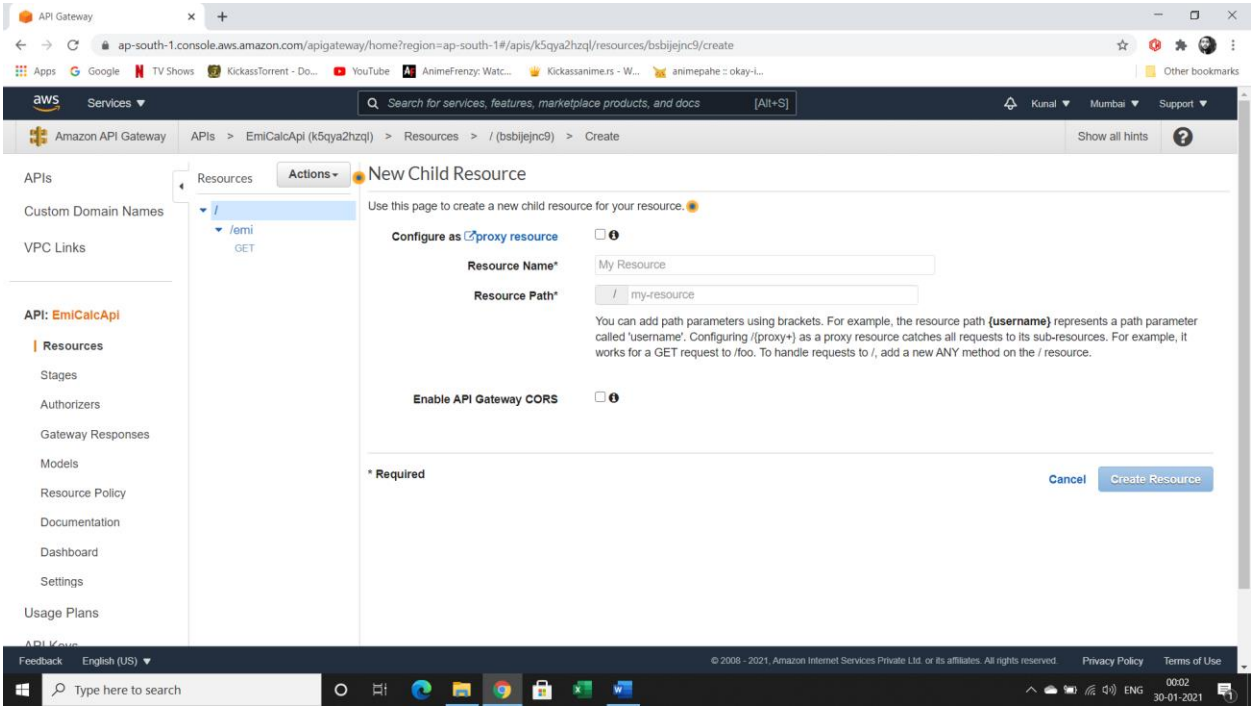
- In the settings tab do the following changes
- API name = EmiCalcApi
- Description = EmiCalcApi
- Endpoint type = Regional
- Click on create tab

- Next step click on action then create resource

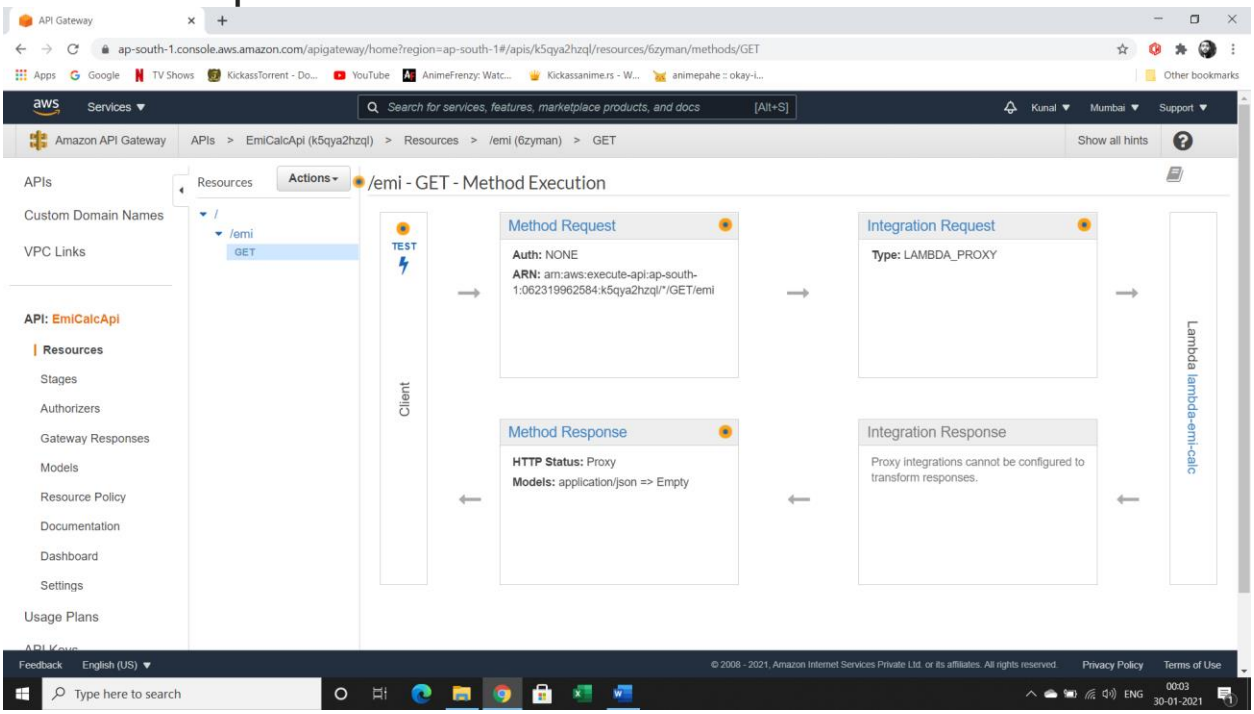


- Enter resource name as emi

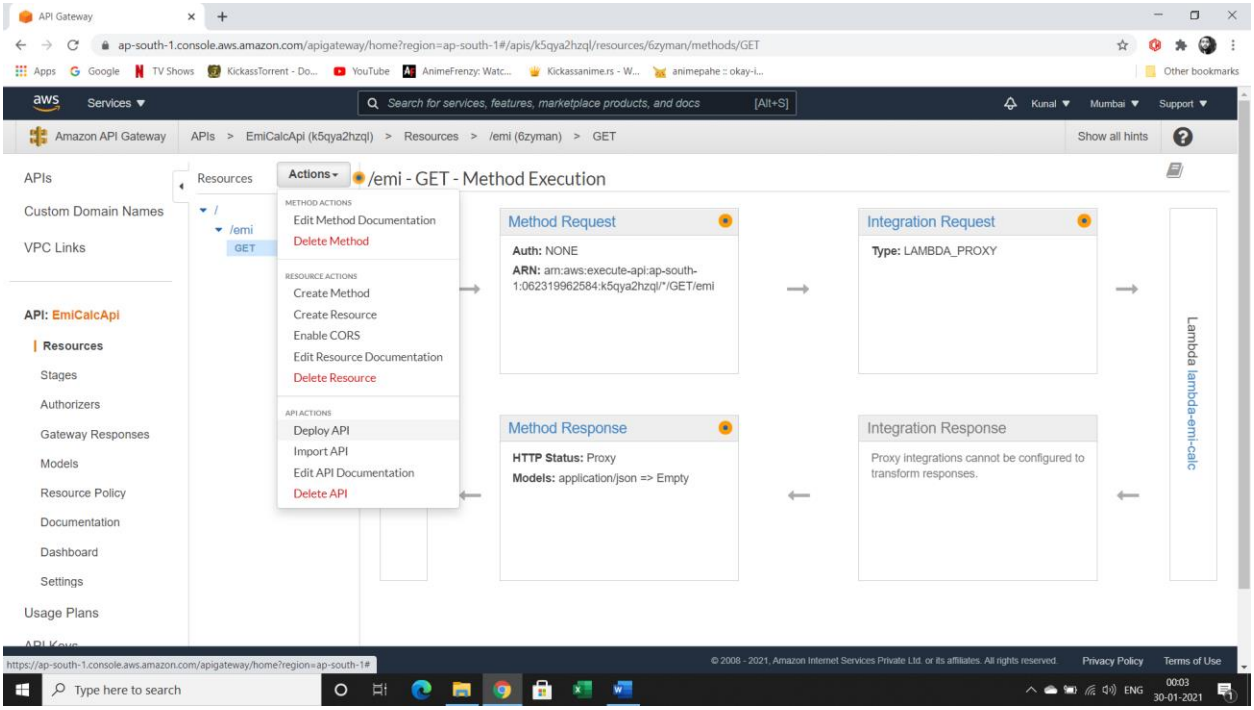
- And create the resource



- Now select on action tab and create method
- Use get parameter
- We are using integration type as Lambda Function
- Enter lambda function as lambda-emi-calc
- Save the changes
- Grant permission for lambda function

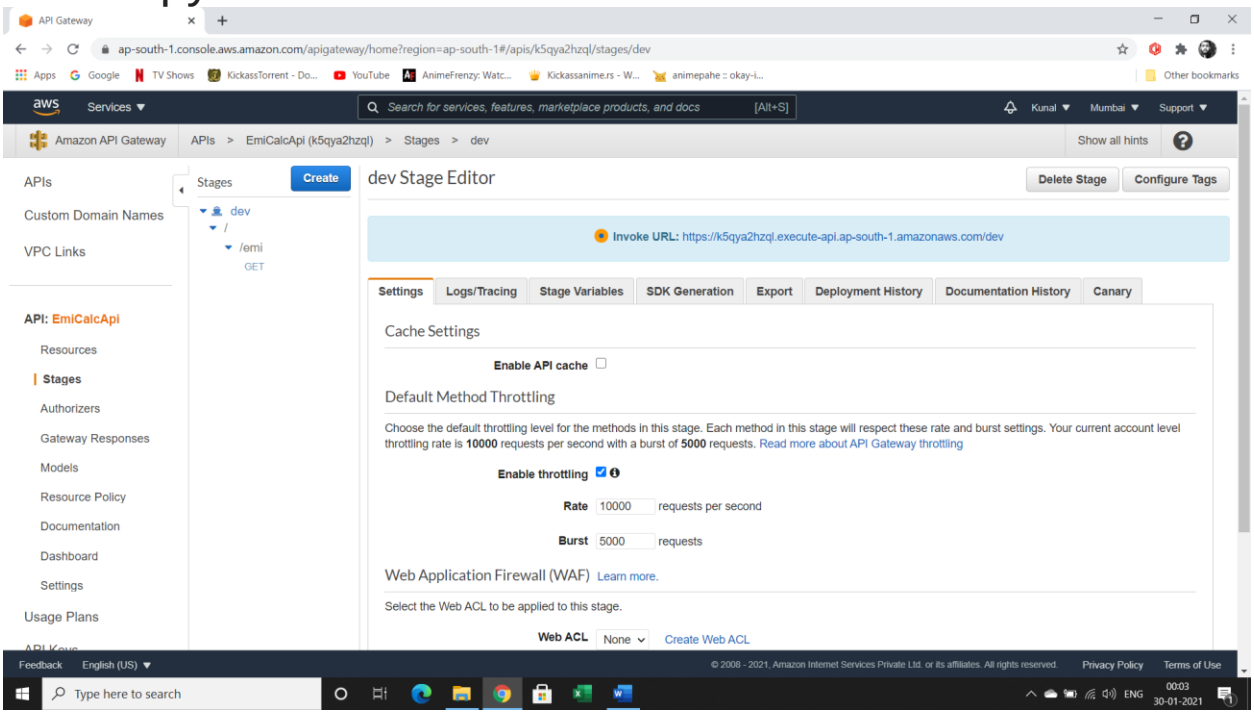


- Next step is to click on action and then deploy api



- Enter deployment stage as New Stage
- Enter stage name as dev
- Stage description as dev
- Deployment description as dev
- After that click on GET method

- Copy the URL



- To calculate the EMI we have to place valid parameters

- We have 3 parameters

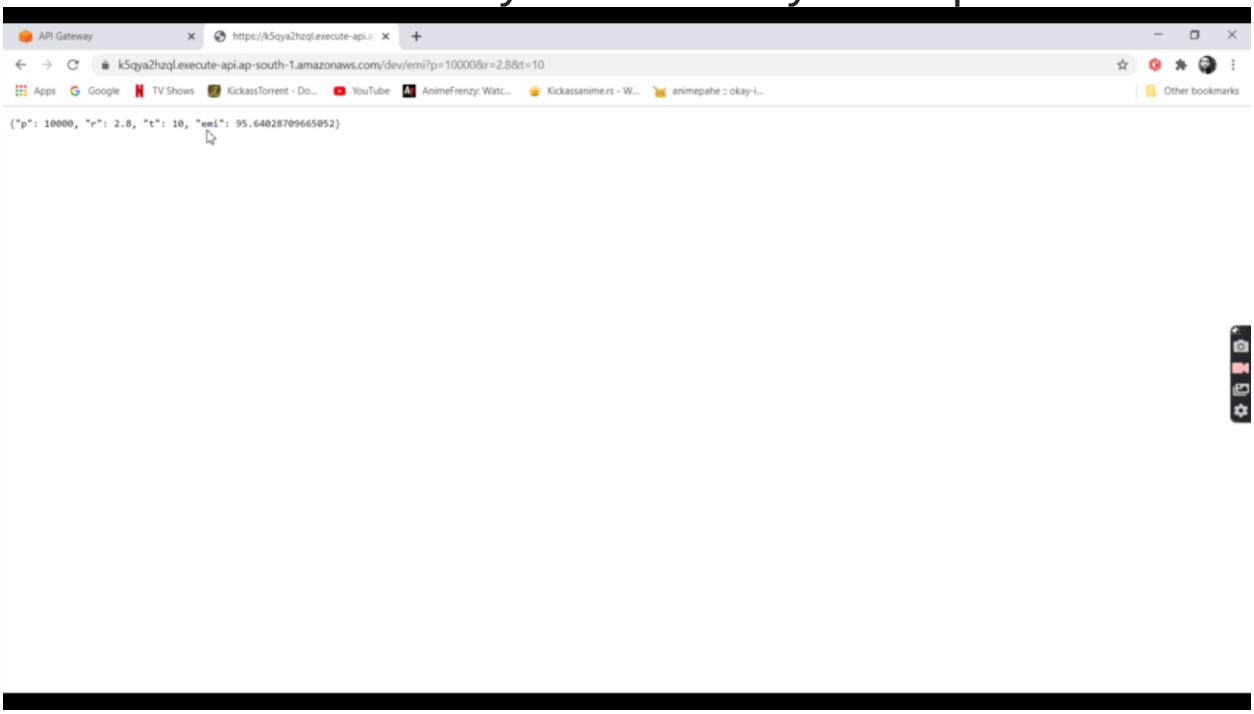
  Principle = p
  Rate = r
  Time = t

- Add the follow to the copied url

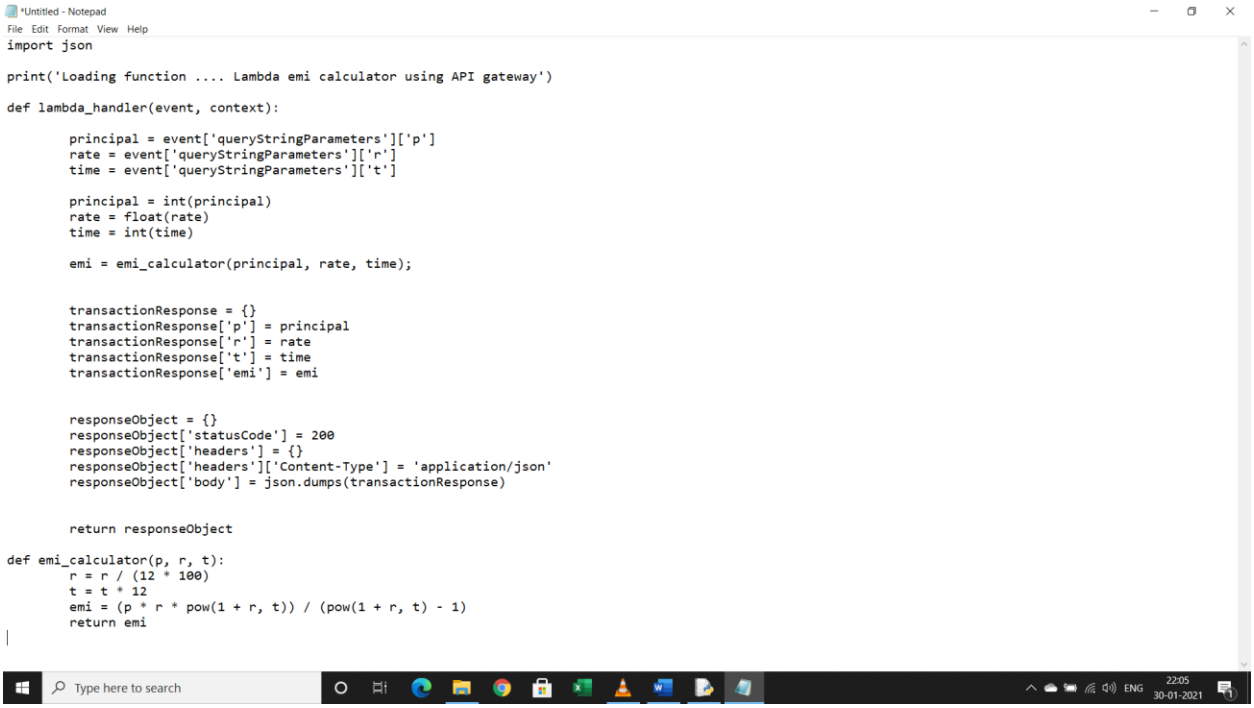
- ?p= certain value for eg 10000

- Then add rate (r) as certain value 2.8 and the final value time as 10

- emi?p=10000&r=2.8&t=10
- Click on enter and you will have your required emi



Python Code for EMI Calculator


*Untitled - Notepad
File Edit Format View Help
import json
print('Loading function .... Lambda emi calculator using API gateway')
def lambda_handler(event, context):
principal = event['queryStringParameters']['p']
rate = event['queryStringParameters']['r']
time = event['queryStringParameters']['t']
principal = int(principal)
rate = float(rate)
time = int(time)
emi = emi_calculator(principal, rate, time);
transactionResponse = {}
transactionResponse['p'] = principal
transactionResponse['r'] = rate
transactionResponse['t'] = time
transactionResponse['emi'] = emi
responseObject = {}
responseObject['statusCode'] = 200
responseObject['headers'] = {}
responseObject['headers']['Content-Type'] = 'application/json'
responseObject['body'] = json.dumps(transactionResponse)
return responseObject
def emi_calculator(p, r, t):
r = r / (12 * 100)
t = t * 12
emi = (p * r * pow(1 + r, t)) / (pow(1 + r, t) - 1)
return emi
Type here to search
ENG
22:05
30-01-2021